# TM 9-767

## WAR DEPARTMENT TECHNICAL MANUAL

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# 40-TON
# TANK TRANSPORTER
# TRUCK-TRAILER M25

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*WAR DEPARTMENT* *FEBRUARY 1944*

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# TRUCK-TRAILER M25

*WAR DEPARTMENT*
*February 1944*

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**WAR DEPARTMENT**
**Washington 25, D. C., 23 February 1944**

TM 9-767, 40-Ton Tank Transporter Truck-trailer M25, is published for the information and guidance of all concerned.

[A.G. 300.7 (6-14-43)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:
J. A. ULIO,
*Major General,*
*The Adjutant General.*

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(For explanation of symbols, see FM 21-6.)

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# PART I—VEHICLE OPERATING INSTRUCTIONS

## Section I

## INTRODUCTION

Paragraph
Scope . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1

### 1. SCOPE.

**a.** This technical manual is published for the information and guidance of the using arm personnel charged with the operation and maintenance of this materiel.

**b.** In addition to a description of the 40-ton, Tank Transporter Truck-trailer M25, this manual contains technical information required for the identification, use, and care of materiel. The manual is divided into four parts. Part One, section I through section VIII, contains vehicle operating instructions. Part Two, section IX through section XXXIII, contains vehicle maintenance instructions for using arm personnel charged with the responsibility of doing tractor maintenance work within their jurisdiction. Part Three, section XXXIV through section XL, contains semitrailer maintenance instructions for using arm personnel. Part Four, section XLI, contains instructions for shipment, and temporary storage.

**c.** In all cases where the nature of the repair, modifications, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed so that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

**d. MWO and Major Unit Assembly Replacement Record.**

(1) DESCRIPTION. Every vehicle is supplied with a copy of A.G.O. Form No. 478, which provides a means of keeping a record of each MWO (FSMWO) completed or major unit assembly replaced. This form includes spaces for the vehicle name and U. S. A. Registration Number, instructions for use, and information pertinent to the work accomplished. It is very important that the form be used as directed and that it remain with the vehicle until the vehicle is removed from service.

(2) INSTRUCTIONS FOR USE. Personnel performing modifications or major unit assembly replacements must record clearly on the form a description of the work completed and must initial the form in the columns provided. When each modification is completed, record the date, hours and/or mileage, and MWO number. When major unit assemblies, such as engines, transmissions, transfer cases, are replaced, record the date, hours and/or mileage and nomenclature of the unit assembly. Minor repairs and minor parts and accessory replacements need not be recorded.

(3) EARLY MODIFICATIONS. Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the MWO numbers of modifications applied prior to the date of the A.G.O. Form No. 478.

## Section II

## DESCRIPTION AND TABULATED DATA

Paragraph
Description .................................................. 2
Data .................................................. 3

### 2. DESCRIPTION.

a. The 40-ton, Tank Transporter Truck-trailer M25 is designed for use in recovering a piece of damaged materiel and transporting it to a place where necessary repairs can be accomplished. The M25 unit consists of the tractor truck (M26) and semitrailer (M15), the semitrailer being coupled to the tractor by means of a fifth wheel on the tractor, which automatically locks the trailer to the tractor. Air brakes on the trailer wheels and lighting equipment on the trailer are connected to the tractor air and lighting systems by means of air hose and a jumper cable (carried on the trailer). The trailer air brakes and lights are controlled by the driver of the tractor. The trailer air brakes are automatically set in case the trailer is accidentally, or purposely, disconnected from the tractor.

b. The tractor truck M26 is a self-propelled motor vehicle, powered by a 6-cylinder internal-combustion gasoline engine. There are two front and eight rear dual wheels equipped with desert, or combat type, pneumatic tires. The rear wheels are driven by roller type chains operating on sprockets fastened to the wheel hubs. The power to drive the rear wheels is obtained from the engine, through the clutch, main and auxiliary transmissions, rear differential and jackshafts to the drive sprockets which are bolted to the jackshaft hubs. Roller chains on the jackshaft hub sprockets and on the wheel hub sprockets, drive the wheels. The tractor can be used as a recovery vehicle without the semitrailer, since it is equipped with a front mounting winch, a rear tandem winch, and a vertical lifting device. The cab is armor plated and has hinged armor plate covers for the windshield, radiator, doors, and cab windows. All of these armor plate covers are operated from inside the cab and have peep ports. A pintle hook is bolted to the rear end of the frame. Towing shackles are fastened to the front and rear of the frame. A drawbar and whiffletree are carried on the tractor, for recovery operations. Oxygen and acetylene tanks with equipment for welding or cuttings; vise, Pioneer, and maintenance tools are also carried on the tractor.

c. The semitrailer (M15) is designed to be pulled by the tractor truck (M26) and consists of a low drop frame having a low bed-type platform. Eight single wheels equipped with pneumatic tires are used to carry the semitrailer, which has a maximum pay load of 40 tons to be carried at a maximum speed of 26 miles per hour. The use of walking beams operating on trunnion shafts, allows any one wheel to pass over a 9-inch obstacle while all other wheels remain

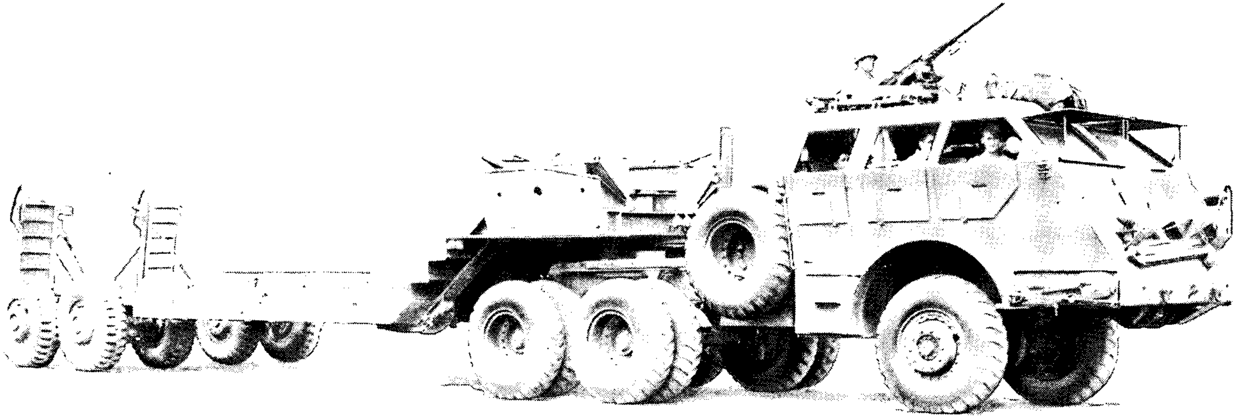

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Figure 1—Right Front Three-quarter View of 40-ton Tank Transporter Truck-Trailer M25

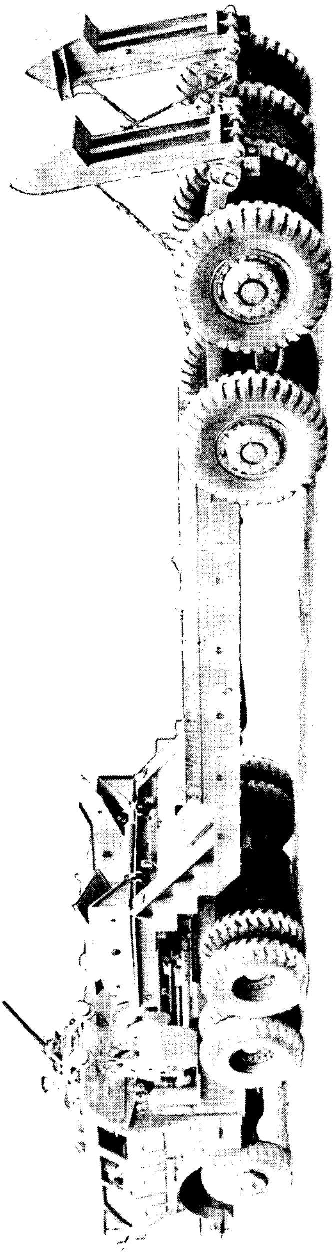

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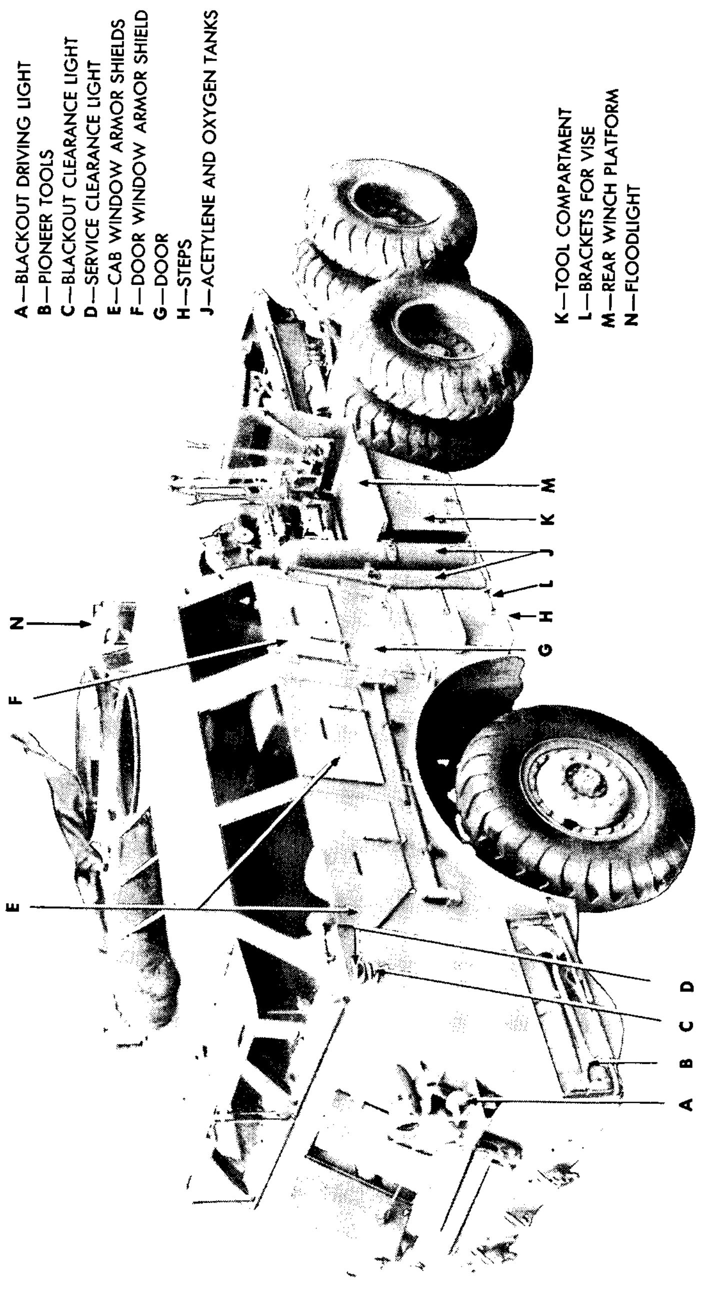
Figure 2—Left Rear Three-quarter View of 40-ton Tank Transporter Truck-Trailer M25

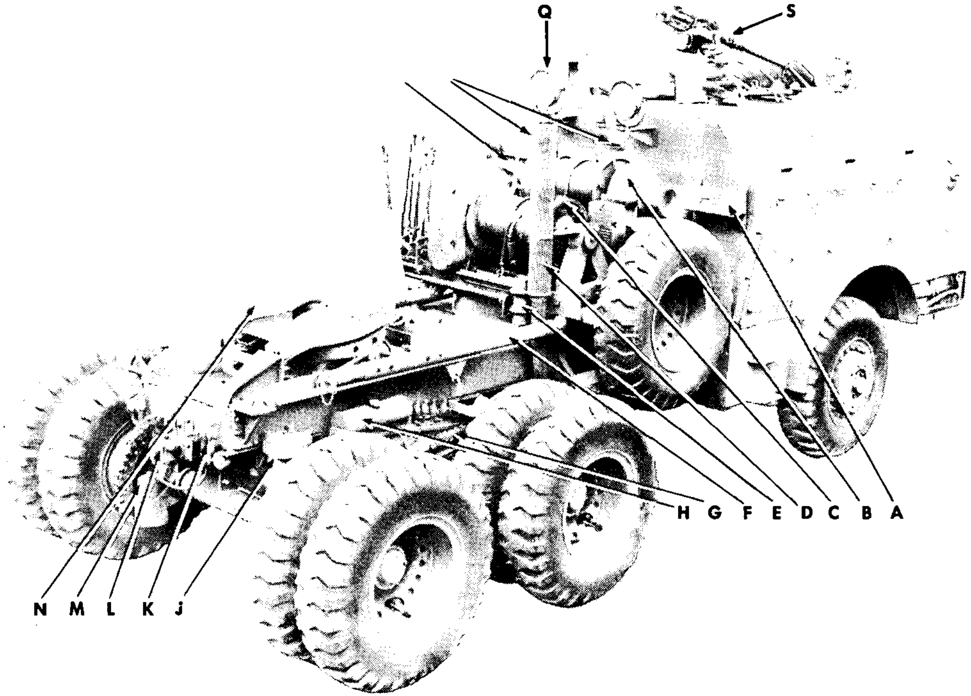


A—BLACKOUT DRIVING LIGHT
B—PIONEER TOOLS
C—BLACKOUT CLEARANCE LIGHT
D—SERVICE CLEARANCE LIGHT
E—CAB WINDOW ARMOR SHIELDS
F—DOOR WINDOW ARMOR SHIELD
G—DOOR
H—STEPS
J—ACETYLENE AND OXYGEN TANKS

K—TOOL COMPARTMENT
L—BRACKETS FOR VISE
M—REAR WINCH PLATFORM
N—FLOODLIGHT

RA PD 48202

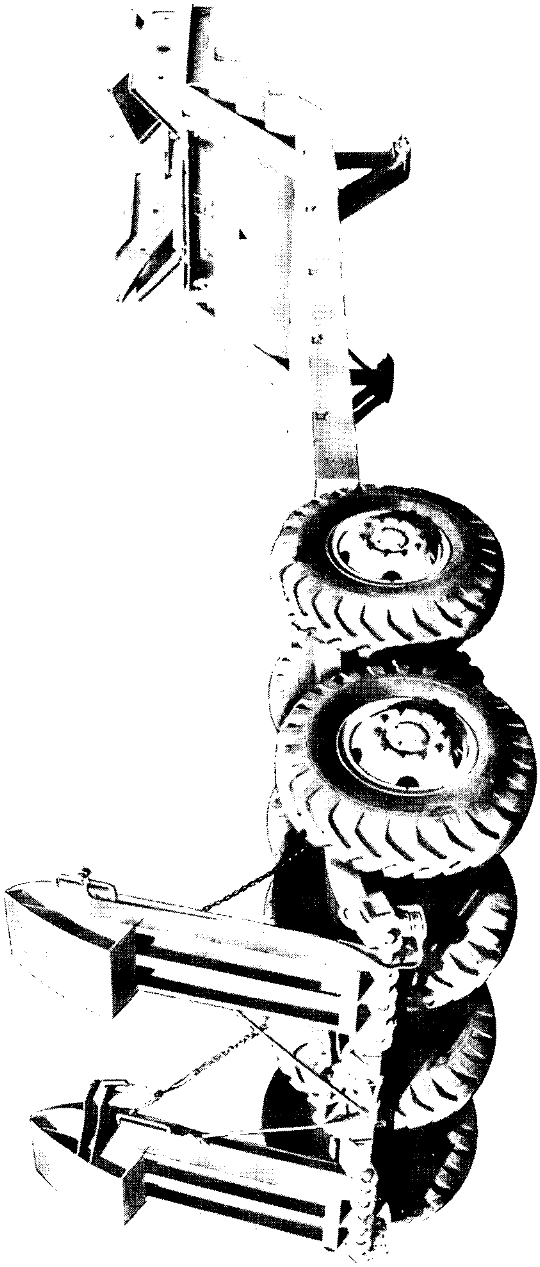
***Figure 3—Left Front Three-quarter View of Tractor Truck M26 (Windows Open)***



A—FLARES
B—REAR UPPER WINCH
C—REAR LOWER WINCH
D—EXHAUST STACK AND SHIELD
E—JIB CRANE SOCKET
F—VERTICAL LIFTING DEVICE
G—DRIVE CHAIN
H—DRIVE CHAIN OILING SYSTEM
J—STABILIZER COIL SPRINGS
K—SHACKLE FOR TOWING
L—PINTLE
M—BRAKE CYLINDER
N—FIFTH WHEEL ASSEMBLY
P—WHIFFLETREE
Q—FLOODLIGHT
R—REAR WINDOWS
S—GUN, MACHINE, .50 CAL., M32

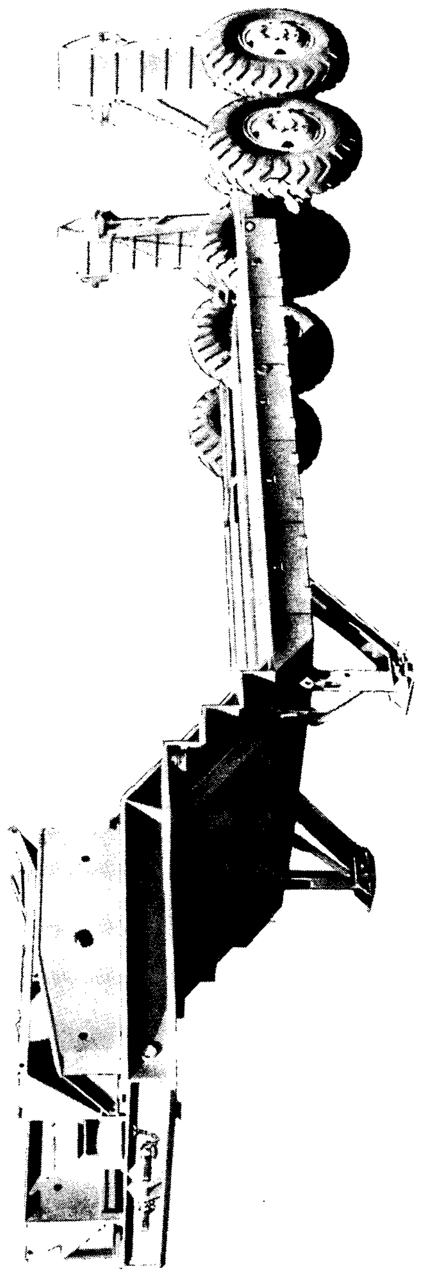
RA PD 48206

Figure 4—Right Rear Three-quarter View of Tractor Truck M26 (Windows Closed)



RA PD 57458

Figure 5—Right Rear Three-quarter View of Semitrailer M15

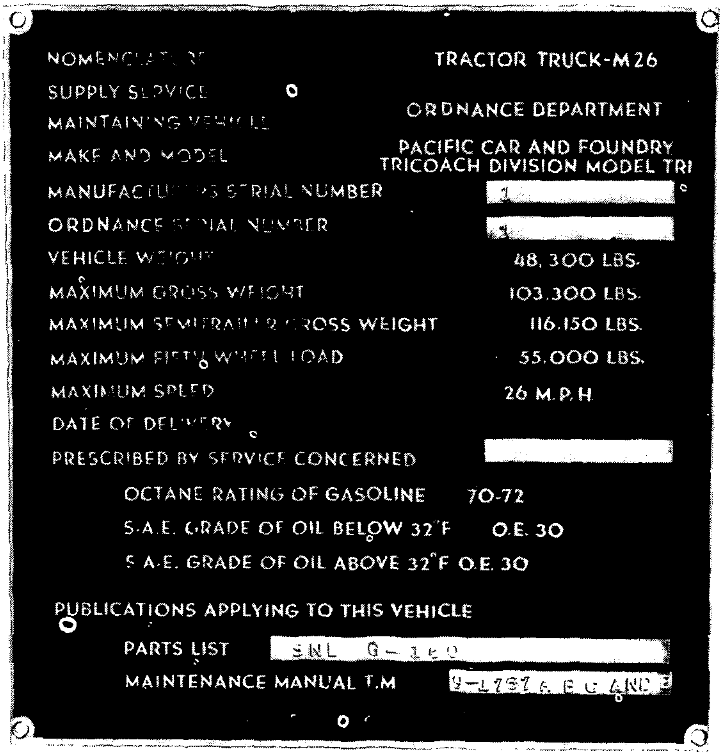


RA PD 57459

Figure 6—Left Front Three-quarter View of Semitrailer M15

## DESCRIPTION AND TABULATED DATA

in contact with the ground. Brakes on the semitrailer wheels are actuated by compressed air supplied from the truck tractor, through removable hose which connect the semitrailer to the tractor. There are four clearance lights, two of which are on the right and left side at the rear cross member, and two are on the right and left front side at the steps. There are four blackout clearance lights which are located directly under the service clearance lights. Two auxiliary clearance lights are stowed on the left side. Two clips are provided to hold clearance lights in stowed position. A blackout taillight, service taillight and stop light, and service stop light, also, a blackout taillight and stop light are located on the rear cross member of the semitrailer and are operated by the same switches that operate the truck tractor clearance taillight and stop lights. Pioneer Tools, recovery equipment, hoist for changing tires and for maintenance work, and maintenance tools are carried on the trailer.



| | |
|---|---|
| NOMENCLATURE | TRACTOR TRUCK-M26 |
| SUPPLY SERVICE<br>MAINTAINING VEHICLE | ORDNANCE DEPARTMENT |
| MAKE AND MODEL | PACIFIC CAR AND FOUNDRY<br>TRICOACH DIVISION MODEL TRI |
| MANUFACTURER'S SERIAL NUMBER | |
| ORDNANCE SERIAL NUMBER | |
| VEHICLE WEIGHT | 48,300 LBS. |
| MAXIMUM GROSS WEIGHT | 103,300 LBS. |
| MAXIMUM SEMITRAILER GROSS WEIGHT | 116,150 LBS. |
| MAXIMUM FIFTH WHEEL LOAD | 55,000 LBS. |
| MAXIMUM SPEED | 26 M.P.H. |
| DATE OF DELIVERY | |
| PRESCRIBED BY SERVICE CONCERNED | |
| OCTANE RATING OF GASOLINE | 70-72 |
| S.A.E. GRADE OF OIL BELOW 32°F | O.E. 30 |
| S.A.E. GRADE OF OIL ABOVE 32°F | O.E. 30 |

PUBLICATIONS APPLYING TO THIS VEHICLE

| | |
|---|---|
| PARTS LIST | SNL G-160 |
| MAINTENANCE MANUAL T.M | 9-1767 A, B, C AND |

RA PD 76487

*Figure 7—Vehicle Data Plate*

## 3. DATA.

### a. Tractor w/Trailer Specifications.

| | |
|---|---|
| 40-ton tank transporter truck-trailer model No. | M25 |
| Semitrailer, model No. | M15 |
| Tractor truck, model No. | M26 |
| Tractor truck manufacturer | Pacific Car and Foundry Co. |
| Semitrailer manufacturer | Fruehauf Trailer Co. |
| Weight of tractor with semitrailer (gas, oil, water and all equipment) | 103,300 lb |

### b. Tractor Specifications.

| | |
|---|---|
| Curb weight of tractor | 42,000 lb |
| Length, over-all of tractor (uncrated) | 25 ft 4 in. |
| Width, over-all of tractor (uncrated) | 10 ft 10 ¾ in. |
| Maximum fifth wheel load | 55,000 lb |
| Height, over-all of tractor (uncrated) | 11 ft 5 in. |
| Wheel size | 24 in. |
| Tire size | 14.00 x 24 |
| Ply | 20 or 12 |
| Crew | 7 |
| Wheel base of tractor | 14 ft 4 in. |
| Tread, front (center to center) | 82 in. |
| Tread, rear (center to center) | 98½ in. |
| Kind and grade of fuel | 70-72 octane gasoline |
| Ground clearance | 14 in. |
| Pintle or drawbar height, rear | 41½ in. |
| Approach angle | 35 degrees |
| Maximum speed (without towed load) | 28 mph |
| Ground pressure | 90 psi |
| Ground Contact Area: | |
| Each front tire | 123 sq in. |
| Each rear tire | 118 sq in. |

Ground contact gross (zero penetration—75 pounds per square inch, tire pressure).

**c. Performance.** Speeds allowable, without front wheels driving:

| Main Transmission Lever In | Auxiliary Transmission Lever In | Speed Obtained |
|---|---|---|
| first | first | 1.5 |
| first | second direct | 2.5 |
| first | third O.D. | 3.8 |
| second | first | 5.1 |
| second | second direct | 6.5 |
| second | third O.C. | 8.1 |
| third | first | 8.6 |
| third | second direct | 12.0 |
| third | third O.D. | 16.0 |
| fourth | first | 21.0 |
| fourth | second direct | 26.0 |
| fourth | third O.D. | 28.0 |

(NOTE: *Speeds allowable, with front wheels driving, are the same as given above.)*

| | |
|---|---|
| Minimum turning radius (right) | 40 ft |
| (left) | 40 ft |
| Minimum turning circle diameter | 80 ft |
| Fording depth | 56 in. |
| Towing facilities (front) | two clevis hooks and tow bar |
| Towing facilities (rear) | two clevis hooks and pintle (quick release) |
| Maximum grade ascending ability | 30% |
| Maximum allowable engine speed | 2,100 rpm |

**d. Tractor Capacities.**

| | |
|---|---|
| Transmission | 8½ qt |
| Transfer case | 12 qt |
| Front axle | 20 qt |
| Rear axle | 10 qt |
| Fuel (in two tanks) | 120 gal |
| Cooling system | 14 gal |
| Crankcase | 28 qt |

**e. Semitrailer Specifications.**

| | |
|---|---|
| Length, over-all (with permanent ramps in up position) | 38 ft 5$\frac{1}{16}$ in. |
| Length, over-all (with permanent ramps in down position) | 44 ft 2 in. |
| Width, over-all | 12 ft 6 in. |
| Width, over-all (under-construction) | 10 ft 4 in. |
| Height, over-all | 8 ft 9 in. |
| Height at kingpin | 5 ft 7¾ in. |
| Ground clearance at lower decking | 2 ft 5⅛ in. |
| Height of lower deck | 3 ft 4½ in. |
| Height from lower deck to top deck | 3 ft 3 in. |
| Width of decking | 10 ft 4 in. |
| Wheel size | 24 x 10.00 |
| Tire size | 14.00 x 24—20 ply |
| Tire types | both combat and desert types are used |
| Tread (center to center) | 10 ft 11 in. |
| Weight of semitrailer equipped | 36,100 lb |
| Maximum semitrailer gross weight | 55,000 lb |
| Minimum ground clearance (unloaded) | 13 in. |

## Section III

# DRIVING CONTROLS AND OPERATION

Paragraph

Instruments and controls .......... 4

Use of instruments and controls in vehicular operation....... 5

Towing the vehicle .......... 6

## 4. INSTRUMENTS AND CONTROLS.

a. **Air Pressure Gage** (AT, fig. 8). The air pressure gage is located at the left of the tachometer tell-tale lock on the instrument panel and registers the amount of air pressure in the two air reservoirs. The dial is graduated from zero to 150 in 10-pound divisions.

b. **Low-pressure Indicator Buzzer.** The low-pressure indicator buzzer is located on the front side of the dash and gives a buzzing sound whenever the air pressure is below a safe operating pressure. The buzzer is an electric vibrator operated by the air pressure in the air reservoirs through a low-pressure indicator.

c. **Oil Pressure Gage** (AH, fig. 8). The oil pressure gage is located on instrument panel to the left of ignition switches. This gage registers the pressure, in pounds per square inch, of the oil being circulated throughout the engine by the oil pump. The oil pressure gage does not indicate the amount of oil in the engine. The dial is graduated from zero to 120 in 10-pound divisions.

d. **Oil Temperature Gage** (F, fig. 8). The oil temperature gage is located on the instrument panel above the oil pressure gage. The temperature, in degrees Fahrenheit, of the engine oil is registered by this gage. The dial is graduated from 100°F to 320°F.

e. **Water Temperature Gage** (AR, fig. 8). The water temperature gage is located in the lower left corner of the instrument panel, and registers in degrees (Fahrenheit) the temperature of the coolant in the engine cooling system. The dial is graduated from 100°F to 220°F.

f. **Fuel Gages** (AV and J, fig. 8). There are two fuel gages, one in the upper right corner of the instrument panel for the right fuel tank, and the other in the opposite corner for the left fuel tank. The right fuel tank gage indicates how much fuel is in the right fuel tank and the left gage, how much fuel is in left fuel tank.

g. **Tachometer** (E, fig. 8). The tachometer is located in the center of the instrument panel and registers revolutions of the engine by hundreds; that is, the 5 indicates 500 revolutions per minute of the engine. The dial is graduated from 3 to 24, which indicates revolutions per minute of 300 to 2,400.

h. **Speedometer** (B, fig. 8). The speedometer is located at left center of the instrument panel and indicates the road speed of the tractor in miles per hour. The dial is graduated from zero to 60 and both trip mileage and total mileage are shown on the odometer.

i. **Ammeter** (C, fig. 8). The ammeter is located on the instrument panel just above the air pressure gage and indicates whether or not the generator current is charging the battery. The dial is graduated to show discharge (negative reading) on left side of dial and charge (positive reading) on right side of dial. The graduations are in amperes and read from zero to 100.

j. **Brake Pedal** (AF, fig. 8). The brake pedal is located in the floorboard immediately to the right of the steering column and controls the air-operated brakes on the rear wheels of the tractor. If semitrailer is attached to tractor with air hose connected, the semitrailer wheel brakes will also be applied.

k. **Semitrailer Air Brake Hand Lever** (AA, fig. 8). The semitrailer air brake hand lever is located in the center of the steering column beneath the steering wheel. This lever applies the wheel brakes on the semitrailer only.

l. **Right Air Brake Hand Lever** (Z, fig. 8). The right air brake hand lever is located on the right side of the steering column beneath the steering wheel. This control applies the brakes on the right rear wheels of the tractor and has no effect on semitrailer wheel brakes.

m. **Left Air Brake Hand Lever** (AJ, fig. 8). The left air brake hand lever is located on the left side of the steering column beneath the steering wheel. This control applies the brakes on the left rear wheels of the tractor and has no effect on semitrailer wheel brakes.

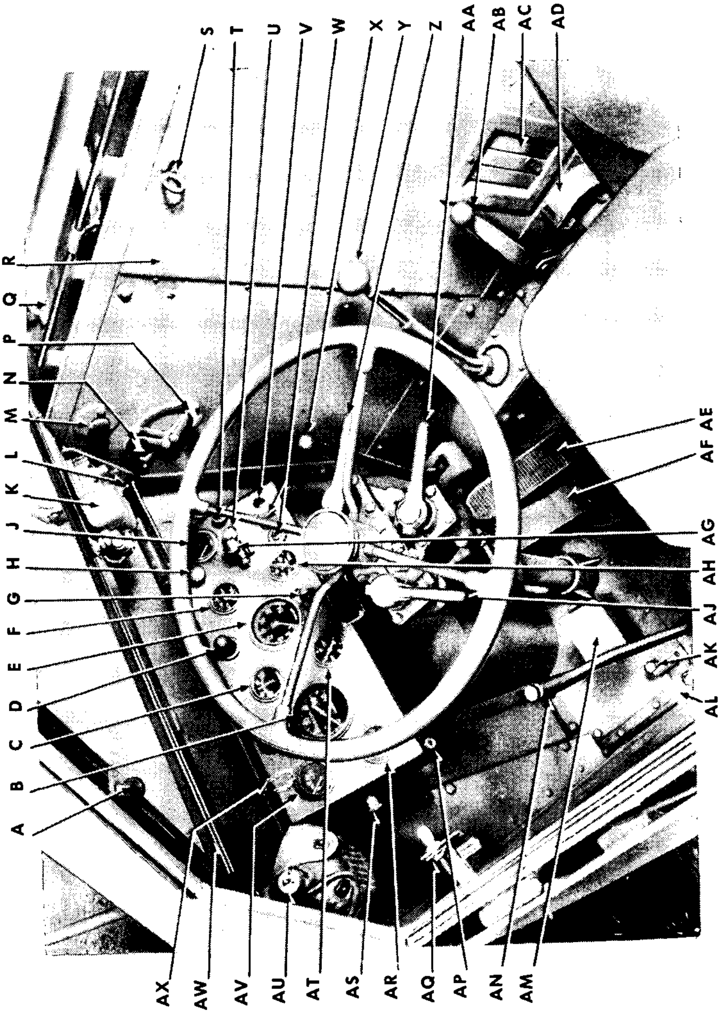
n. **Propeller Shaft Brake Lever** (AN, fig. 8). The propeller shaft brake lever is located at the left of the driver and is used to apply the brake, which is located on the propeller shaft at the front of the tractor rear differential carrier.

o. **Clutch Pedal** (AM, fig. 8). The clutch pedal is located in the floorboard to the left of the steering column and is used to disengage and engage the engine clutch in order to transmit power to the driving wheels.

p. **Accelerator Pedal** (AE, fig. 8). The accelerator pedal is located in the floorboard to the right of the brake pedal and is used to accelerate the engine revolutions per minute for increasing engine power for driving the vehicle or for operation of the winches.

q. **Hand Throttle Lever** (N, fig. 8). The hand throttle lever is located at the upper right front corner of the driving compartment on the side cover of the radiator and within reach of the driver's right hand. The lever is secured to a sector, and is used for setting the engine revolutions per minute at a definite rate for traveling over long distances, or for recovery operations.

r. **Fuel Tank Change-over Valve** (AD, fig. 8). The fuel tank change-over valve is located at the right of driver's seat just back of the front axle declutch lever. When fuel in one tank is exhausted, turning the valve lever permits fuel in opposite tank to be used.


A
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RA PD 76921

*Figure 8—Instrument Panel and Driver's Controls*

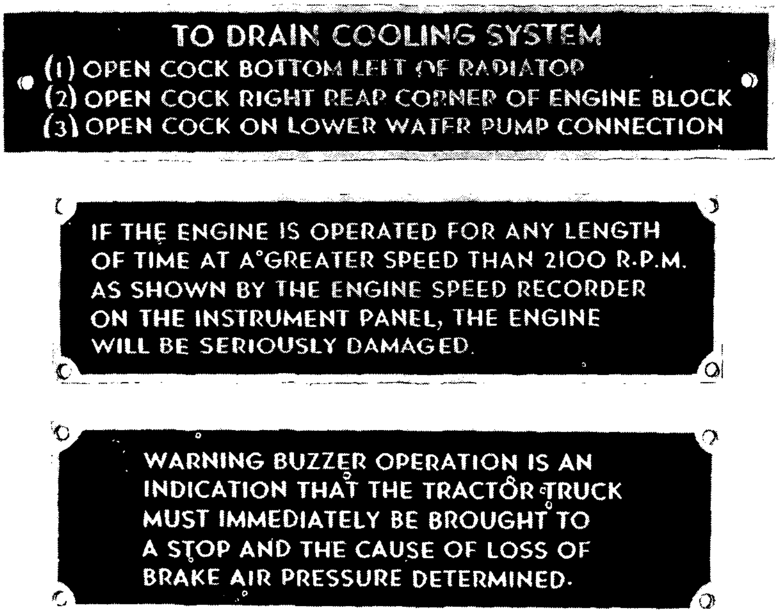
A—WINDSHIELD THUMB SCREW
B—SPEEDOMETER
C—AMMETER
D—INSTRUMENT PANEL LIGHT
E—TACHOMETER
F—OIL TEMPERATURE GAGE
G—TACHOMETER TELLTALE LOCK
H—FLOODLIGHT SWITCH
J—FUEL GAGE (RIGHT FUEL TANK)
K—WINDSHIELD WIPER
L—WINDSHIELD WIPER SWITCH
M—AIR HORN BUTTON
N—HAND THROTTLE LEVER
P—CHOKE LEVER
Q—RADIATOR FILLER CAP COVER
R—ENGINE COMPARTMENT SIDE COVER (DOOR)
S—TURNBUCKLE
T—SIREN LIGHT SWITCH
U—BLACKOUT DRIVING LIGHT SWITCH
V—STARTER SWITCH
W—IGNITION SWITCHES
X—AUXILIARY TRANSMISSION SHIFT LEVER
Y—MAIN TRANSMISSION SHIFT LEVER
Z—RIGHT AIR BRAKE HAND CONTROL
AA—TRAILER BRAKE HAND CONTROL
AB—FRONT AXLE DECLUTCH LEVER
AC—ENGINE VENTILATOR
AD—FUEL TANK CHANGE-OVER VALVE
AE—ACCELERATOR PEDAL
AF—BRAKE PEDAL
AG—LIGHT SWITCH
AH—OIL PRESSURE GAGE
AJ—LEFT AIR BRAKE HAND CONTROL
AK—HEADLIGHT DIMMER SWITCH
AL—WINDSHIELD RACK
AM—CLUTCH PEDAL
AN—HAND BRAKE LEVER
AP—SIREN SWITCH
AQ—WINDSHIELD RACK
AR—WATER TEMPERATURE GAGE
AS—INSTRUMENT PANEL LIGHT SWITCH
AT—AIR PRESSURE GAGE
AU—CANTEEN
AV—FUEL GAGE (LEFT FUEL TANK)
AW—WINDSHIELD
AX—CHAIN AND WING SCREW FOR INSTRUMENT PANEL

***Legend for Figure 8—Instrument Panel and Driver's Controls*** **RA PD 76921A**

**s. Choke Lever** (P, fig. 8). The choke lever is located on the same sector as the hand throttle lever and is used to regulate the richness of the fuel mixture when starting a cold engine.

**t. Tachometer Tell-tale Lock** (G, fig. 8). The tachometer tell-tale lock is located at the left side of the oil pressure gage on the instrument panel and is used to reset the red hand of the tachometer, which stops at highest revolutions per minute at which engine has been operated.

**u. Ignition Switches** (W, fig. 8). There are two ignition switches located at the right lower corner of the instrument panel and to the left of the starter switch. The engine has dual ignition (two spark plugs in each cylinder) and the right ignition switch controls the spark plugs on the right side of the engine, and the left ignition switch, the plugs on the left side of engine.



TO DRAIN COOLING SYSTEM
(1) OPEN COCK BOTTOM LEFT OF RADIATOR
(2) OPEN COCK RIGHT REAR CORNER OF ENGINE BLOCK
(3) OPEN COCK ON LOWER WATER PUMP CONNECTION

IF THE ENGINE IS OPERATED FOR ANY LENGTH OF TIME AT A GREATER SPEED THAN 2100 R.P.M. AS SHOWN BY THE ENGINE SPEED RECORDER ON THE INSTRUMENT PANEL, THE ENGINE WILL BE SERIOUSLY DAMAGED.

WARNING BUZZER OPERATION IS AN INDICATION THAT THE TRACTOR TRUCK MUST IMMEDIATELY BE BROUGHT TO A STOP AND THE CAUSE OF LOSS OF BRAKE AIR PRESSURE DETERMINED.

RA PD 76488

*Figure 9—Instruction Plates in Cab*

**v. Starter Switch** (V, fig. 8). The starter switch is a push type switch located at the right lower corner of the instrument panel and is the means of starting the engine.

**w. Light Switch** (AG, fig. 8). The light switch is a push-pull type switch located on the instrument panel above the two ignition switches and controls two service headlights, one service tail and stop light, two service clearance lights, two blackout marker lights, one blackout tail and stop light, and two blackout clearance lights on the tractor. This switch also controls four service clearance lights, four blackout lights, one service tail and stop light, and one blackout tail and stop light on the semitrailer (fig. 10). The semitrailer wiring junction cable must be attached to the semitrailer and tractor and the blackout switch on the semitrailer must be on either blackout or standard light position.

x. **Floodlight Switch** (H, fig. 8). The floodlight switch is a push-pull switch located on the instrument panel between the oil temperature gage and right fuel gage. This switch is used to operate the two floodlights mounted on the outside rear end of cab. These floodlights have individual switches on them for singular operation.

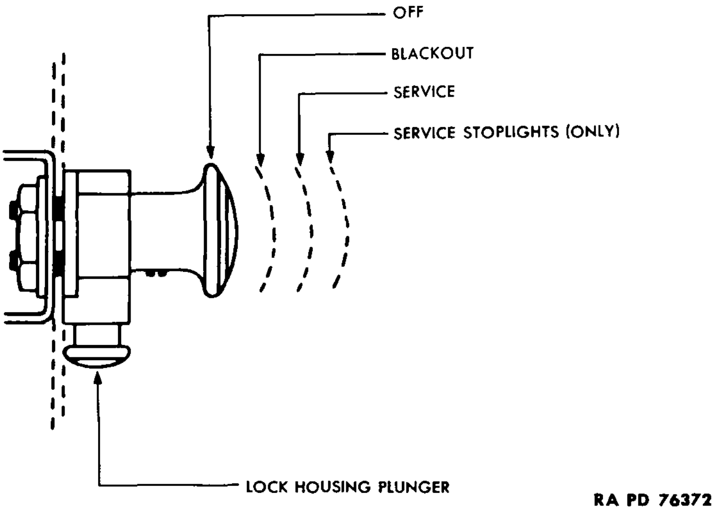


*Figure 10—Operation of Tractor Light Switch*

y. **Blackout Driving Light Switch** (U, fig. 8). The blackout driving light switch is a push-pull switch located at the right side of the main light switch on the instrument panel and controls the blackout driving light on the left front side of the tractor.

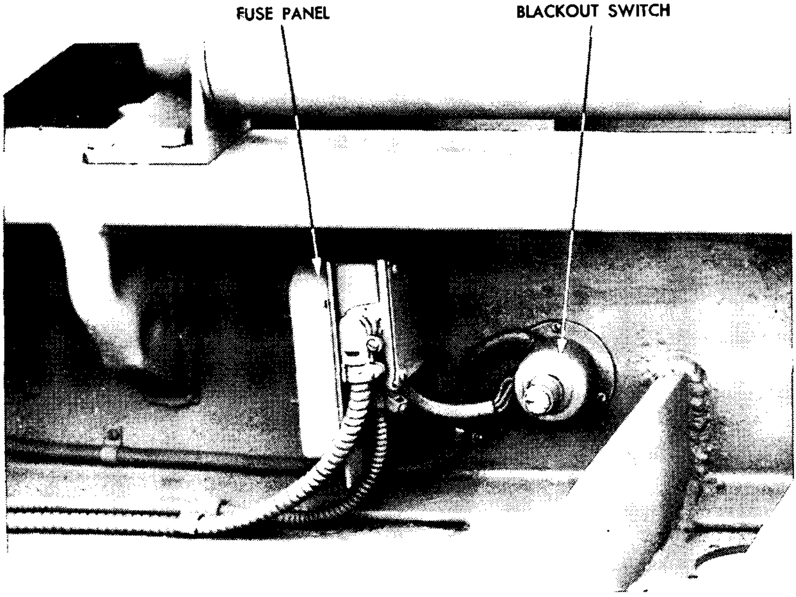
z. **Headlight Dimmer Switch** (AK, fig. 8). The headlight dimmer switch is a tilt switch located on the floor at the left of the clutch pedal, and operates the dim and bright beams of the two headlights when it is depressed.

aa. **Siren Switch** (AP, fig. 8). The siren switch is a push-button switch located at the lower left under side of the instrument panel and controls the siren which is mounted on the left front side of the cab.

**ab. Siren Light Switch** (T, fig. 8). The siren light switch is a push-pull switch located at the right side of the instrument panel, below the right fuel gage and controls the flashing siren light.

**ac. Instrument Panel Light Switch** (AS, fig. 8). The instrument panel light switch is a push-pull switch located on the left vertical side of the instrument panel and controls three instrument panel lights.

**ad. Windshield Wiper Switches** (L, fig. 8). The windshield wiper switches are lever switches located on both windshield wipers for controlling the operation of each windshield wiper.



RA PD 57460

*Figure 11—Semitrailer Fuse Panel and Blackout Switch*

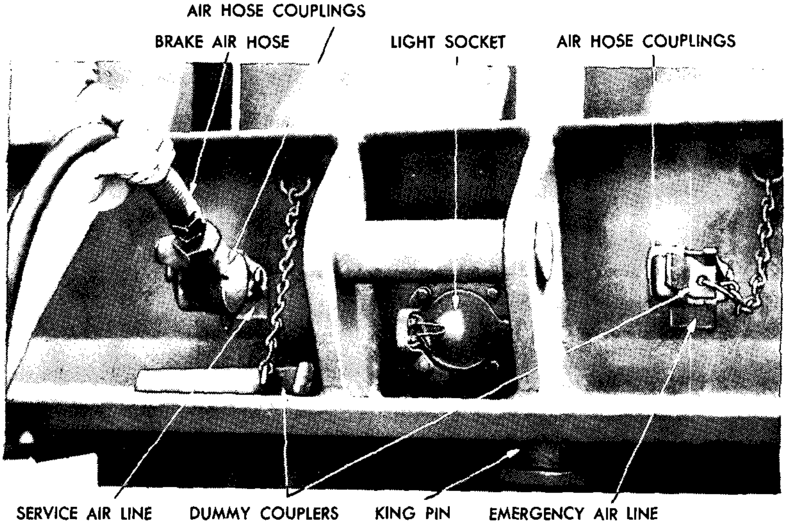
**ae. Main Transmission Shift Lever** (Y, fig. 8). The main transmission shift lever is located in the driving compartment at the driver's right, and is used in conjunction with the clutch pedal when shifting gears in the main transmission.

**af. Auxiliary Transmission Shift Lever** (X, fig. 8). The auxiliary transmission shift lever is located in driving compartment to the right of the driver, and forward of the main transmission shift lever. It is used when shifting auxiliary transmission gears.

**ag. Front Axle Declutch Lever** (AB, fig. 8). The front axle declutch lever is located in the driving compartment at the driver's right and to the rear of the main transmission shift lever. It is used to engage the front axle drive when additional traction and power are needed at the front wheels.

**ah. Front Mounted Winch Power Take-off Lever** (fig. 30). The front mounted winch power take-off control lever is located on the front side of the driver's seat and is used to operate the front winch. The principal use of the front winch is to assist the tractor in getting out of difficult terrain.

**ai. Semitrailer Air Valves.** There are two air valves on the rear of the tractor, just forward of the trailer air connections at the front of the tractor frame rear cross member. These valves must be turned on after the air hose are connected to the tractor and semitrailer.



RA PD 57461

*Figure 12—Semitrailer Light Socket and Air Hose Couplings*

**aj. Windshield Armor Plate Shield** (fig. 3). There are two armor plate shields over the windshields at the front of cab which are used for protection of the crew during combat. These shields are hinged at the top to the cab and are held in their normal, open position by support rods secured on the exterior of the cab front end. The shields are secured to the support rods by a locking device which prevents the shields from being accidentally closed. Latch bolts are secured to the inner side of the shields and from these latch bolts is a chain which passes to the interior of the cab above the windshield. On the end of this chain is an eyelet. Peepholes are an integral part of the shields.

**ak. Radiator Armor Plate Doors** (fig. 3). There are two armor plate doors in the front of the cab and directly in front of the radiator core. These doors are hinged at their outer edge to the cab so that they open horizontally, and each door is connected by linkage to the radiator door and lever which is the left side of the commander's seat inside the cab. These doors are used during combat to protect the radiator core, and are also used in extremely cold weather to assist in bringing the engine operation temperature to normal.

**al. Door and Cab Window Armor Plate Shields** (figs. 3 and 4).

(1) Description. There are drop-type armor plate shields at the top of each of the cab doors and six armor plate shields from the cab windows, two on the right, the left, and the rear of the cab. These shields are hinged at the bottom to the cab rear and side walls. Each shield has a peephole and a latch bolt.

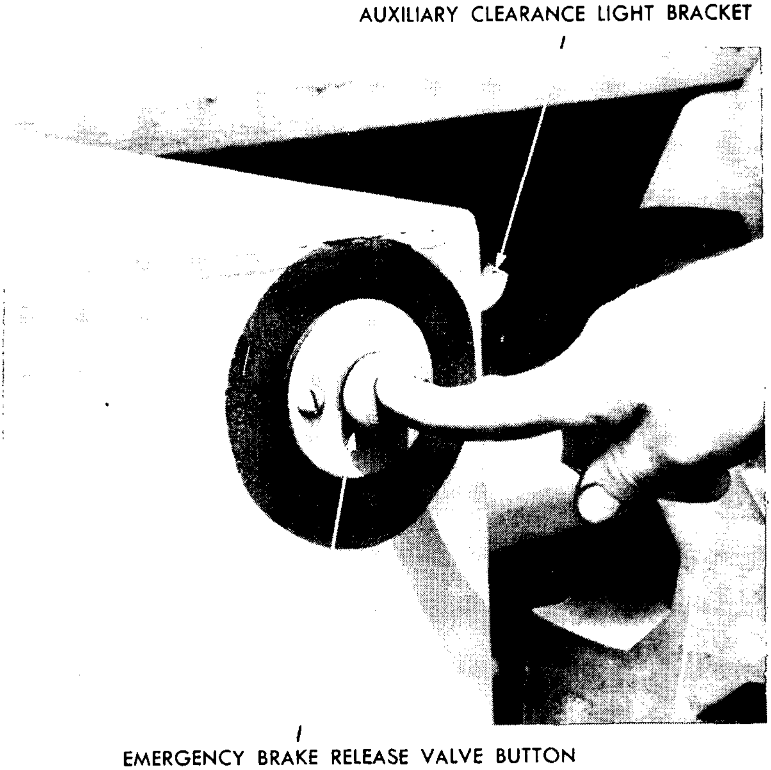

AUXILIARY CLEARANCE LIGHT BRACKET
EMERGENCY BRAKE RELEASE VALVE BUTTON
RA PD 57467

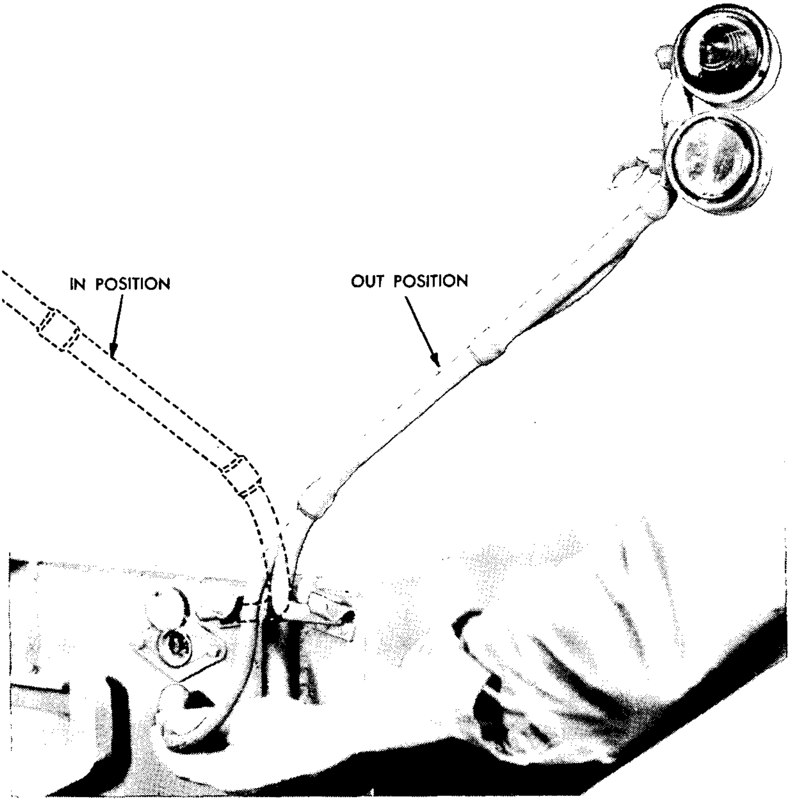
*Figure 13—Semitrailer Brake Release Valve*

**am. Semitrailer Blackout Switch** (fig. 11). The semitrailer blackout switch is mounted at the rear of the trailer second cross member. When the jumper cable between the tractor and trailer is connected, the tractor driver can turn on either blackout or standard driving lights, depending upon the position the switch is in (blackout or standard).

**an. Semitrailer and Tractor Light Sockets** (fig. 12). A jumper cable light socket is mounted at the center of the front cross member of the semitrailer for attachment of the semitrailer jumper cable to provide electrical current for the semitrailer. The tractor light socket is in the rear cross member of the frame.

**ao. Semitrailer Jumper Cable** (fig. 12). The semitrailer jumper cable connects the tractor and semitrailer light sockets to provide electrical current for the semitrailer.

**ap. Semitrailer Air Connecting Hose** (fig. 12). The two semitrailer air connecting hose connect the two air couplings mounted on the front cross member of the semitrailer to the two air couplings mounted on the rear of the tractor frame. These air connecting hose connect the tractor air system to the semitrailer air system.

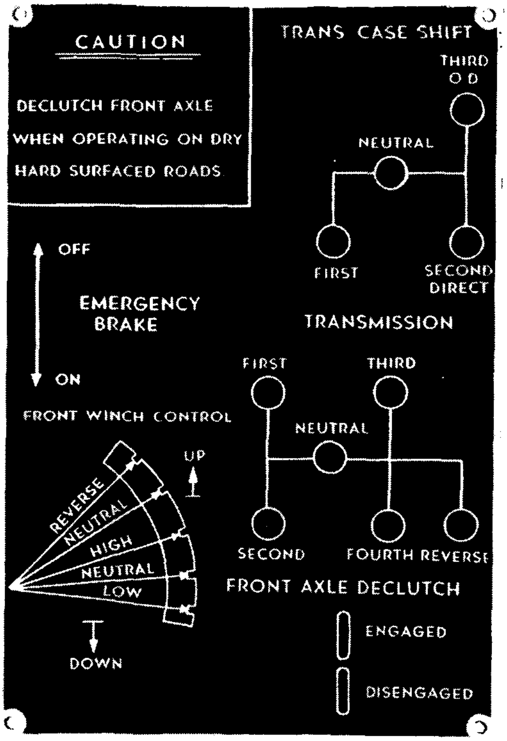


RA PD 57468

*Figure 14—Semitrailer Auxiliary Clearance Lights*

**aq. Semitrailer Rocker Beam Shifting Device** (figs. 24 and 27). The rear under-construction of the semitrailer may be narrowed to permit installation of the semitrailer on a flat car; to drive the semitrailer over a narrow bridge; or for passing through narrow tunnels. This under-construction width is controlled by the rocker beam shifting screw which is located between the rear tires on both the right and left sides of the semitrailer frame.

**ar. Semitrailer Brake Release Valve** (fig. 13). The semitrailer brake release valve is an air-operated valve located ahead of the front tire on the left side of the semitrailer. The purpose of this valve is to enable the tractor operator to release the semitrailer brakes in case the semitrailer air brake hand lever on the tractor fails to function, or if the semitrailer should need to be moved when the tractor is disconnected from the semitrailer. The semitrailer brakes are automatically set whenever the tractor is disconnected from the semitrailer.



CAUTION

DECLUTCH FRONT AXLE WHEN OPERATING ON DRY HARD SURFACED ROADS

TRANS CASE SHIFT
THIRD O D
NEUTRAL
FIRST
SECOND DIRECT
OFF
EMERGENCY BRAKE
ON
TRANSMISSION
FIRST
THIRD
NEUTRAL
SECOND
FOURTH
REVERSE
FRONT WINCH CONTROL
UP
REVERSE
NEUTRAL
HIGH
NEUTRAL
LOW
DOWN
FRONT AXLE DECLUTCH
ENGAGED
DISENGAGED

RA PD 76489

*Figure 15—Transmission, Front Axle, Front Winch and Parking (Emergency) Brake Control Instruction Plate*

**as. Semitrailer Auxiliary Clearance Lights** (fig. 14). There are two auxiliary clearance lights carried at the front of the semitrailer on the left-hand side. These lights are installed in holders on both sides of the semitrailer ahead of the front wheels. A jumper cable is attached to each light assembly for installing into the light socket adjacent to the holder.

**at. Semitrailer Fifth Wheel Release Handle.** The fifth wheel release handle is located on the fifth wheel which is mounted on the rear of the tractor. The purpose of this handle is to enable the operator to release the coupler jaws that lock the tractor and semitrailer together.

## 5. USE OF INSTRUMENTS AND CONTROLS IN VEHICULAR OPERATION.

a. **Before-operation Service.** Perform the service in paragraph 25 before attempting to start the engine.

b. **Starting Engine.**

(1) Apply propeller shaft brake by pulling back on brake hand lever (fig. 8).

(2) Place auxiliary transmission and main transmission shifting levers in their neutral position (fig. 15).

(3) Make certain all rear tandem winch control levers are in their neutral position (fig 15). Be sure that front axle declutch lever is also in position (fig. 15).

(4) Move hand-throttle lever about one-third of the way forward (fig. 8). Then move the choke lever upward about three-quarters of the way. For conditions of extreme heat or cold see section V, paragraphs 20 and 21.

(5) Turn the two ignition switches to their "ON" position (fig. 8). NOTE: *At this point the low air pressure buzzer will start to sound if the air pressure gage reading is below 60 pounds.*

(6) Depress clutch pedal and hold it in depress position until after the engine has been started.

(7) Press starter button and release immediately when engine starts. If engine does not start after two or three trials, release starter button and investigate.

(8) After the engine has started, read the gages and instruments. The oil pressure should register not less than 40 pounds; and if it does, shut off the engine immediately and investigate. The air pressure gage should read not less than 60 pounds; however, if low pressure air indicator buzzer is sounding, wait a few moments for air pressure to build up to 60 pounds. If it does not, shut off the engine and investigate. The ammeter should read on the charge side; tachometer should register about 750 revolutions per minute; the water temperature gage show a gradual rise to 140°F to 160°F. The oil temperature gage must show a gradual rise to about 110°F to 130°F; the fuel gage should register at "F".

(9) Push choke lever down by slow movement until lever is all the way forward. NOTE: *If there is any uneven operation of the engine such as surging or irregular firing investigate the cause.* If air pressure gage does not register at least 60 pounds in about three minutes and low air pressure indicator buzzer ceases sounding, stop the engine and investigate the cause.

c. **Operation of Vehicle.** NOTE: *The controls to be moved, instruments and gages to be watched, are the same whether the tractor alone, or the tractor and semitrailer, are to be operated.*

(1) PLACING TRACTOR WITHOUT SEMITRAILER IN MOTION.

*(a) Shifting to Higher Speeds.* Push clutch pedal down and shift main and auxiliary transmission into first gear. Gearshift must be

made as smoothly and as quietly as possible, without throwing any unnecessary jerk on the driving mechanism when the clutch is engaged. Grasp propeller shaft hand-brake lever so as to release the catch, and then push the lever all the way forward. Depress accelerator pedal sufficiently to increase the engine's revolutions per minute (shown on tachometer) and to move the load. Release clutch pedal slowly while simultaneously depressing the accelerator pedal. This action prevents stalling the engine as the tractor starts to gather momentum. When tractor has gathered momentum and engine speed reaches 1,800 revolutions per minute on tachometer, release the accelerator pedal and depress the clutch pedal simultaneously. Then move the auxiliary shifting lever to second directly (fig. 15). Release clutch pedal slowly and depress accelerator pedal. Pick up further momentum of the tractor until the engine tachometer reads about 1,800 revolutions per minute. NOTE: *The tractor must gain momentum during gear shifting operation. The rear wheels must not be churning in sand or mud.* Momentum of the vehicle decides when gearshift must be made, not revolutions per minute of the engine. Repeat the procedure in preceding step until the highest gear ratio, that the engine can easily handle, is attained. The 12 forward speeds are shown in paragraph 3 and figure 15. The tractor will not move if the auxiliary transmission is not in mesh.

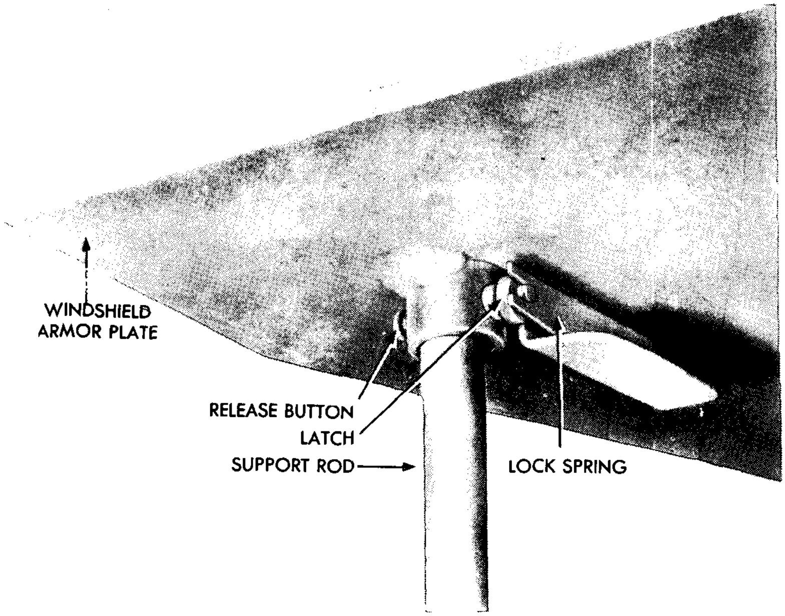
*(b) Shifting to Lower Speeds (Double Clutching).* Shift gears to a low speed before the engine begins to labor or the vehicle begins to lose momentum. Gears must be shifted to a lower ratio if the momentum of the vehicle is dropped to where the tachometer reads 1,300 revolutions per minute. Do not judge the necessity of a shift by the tachometer reading alone. The momentum must be of first importance. To reduce gear ratios use the double clutch method. Disengage the clutch by pressing the clutch pedal and simultaneously releasing the accelerator pedal. Move gearshift lever (fig. 15) to its neutral position, then engage clutch and press accelerator pedal at the same time. When the engine speed, and the desired gearshift speed, are about the same (synchronized), disengage the clutch and shift to the desired gear speed. Do not attempt to shift the transmission into gear until the gear speed has been synchronized with the engine revolutions per minute. Always engage the clutch and depress the accelerator pedal to attain the desired momentum of the vehicle.

*(c) Driving Downhill.* It is generally advisable to go downhill in the next lower gear than would be used to ascend the same hill. The engine governor is not effective in controlling the engine speed when the engine is used as a brake in descending the hill. The engine must not be allowed to over-speed (2,100 rpm) at this time. Use the air brakes to keep the vehicle under full control. CAUTION: *Never shift transmission gears to neutral, or disengage the clutch, and coast downhill. Also do not shut off the engine. Do not make excessive use of the brakes which might cause a loss of air pressure and mean complete loss of control of the vehicle.*

*(d) Shifting into Reverse.* The vehicle must be brought to a complete stop before any shift into reverse is attained. Disengage clutch and place main transmission gearshift lever in reverse (fig. 15). En-

gage clutch and simultaneously depress the accelerator to attain an engine speed that will prevent the engine from stalling. Shift auxiliary transmission to first, second direct, or third O.D. for whatever reverse speed will meet the condition.

*(e) Front Axle Drive.* To engage or disengage the front axle, it is necessary to move the front axle declutch lever into its "engaged" or "disengaged" position (fig. 15). Shifting of this lever will be facilitated by disengaging the engine clutch. The shifting may be made at any time; however, it is easier to shift the lever when the tractor is in motion. Do not attempt to engage the front axle if the rear wheels are spinning. Front axle drive should be used for off-the-road operation. Do not use the front axle drive when operating the vehicle on dry, hard-surfaced roads.



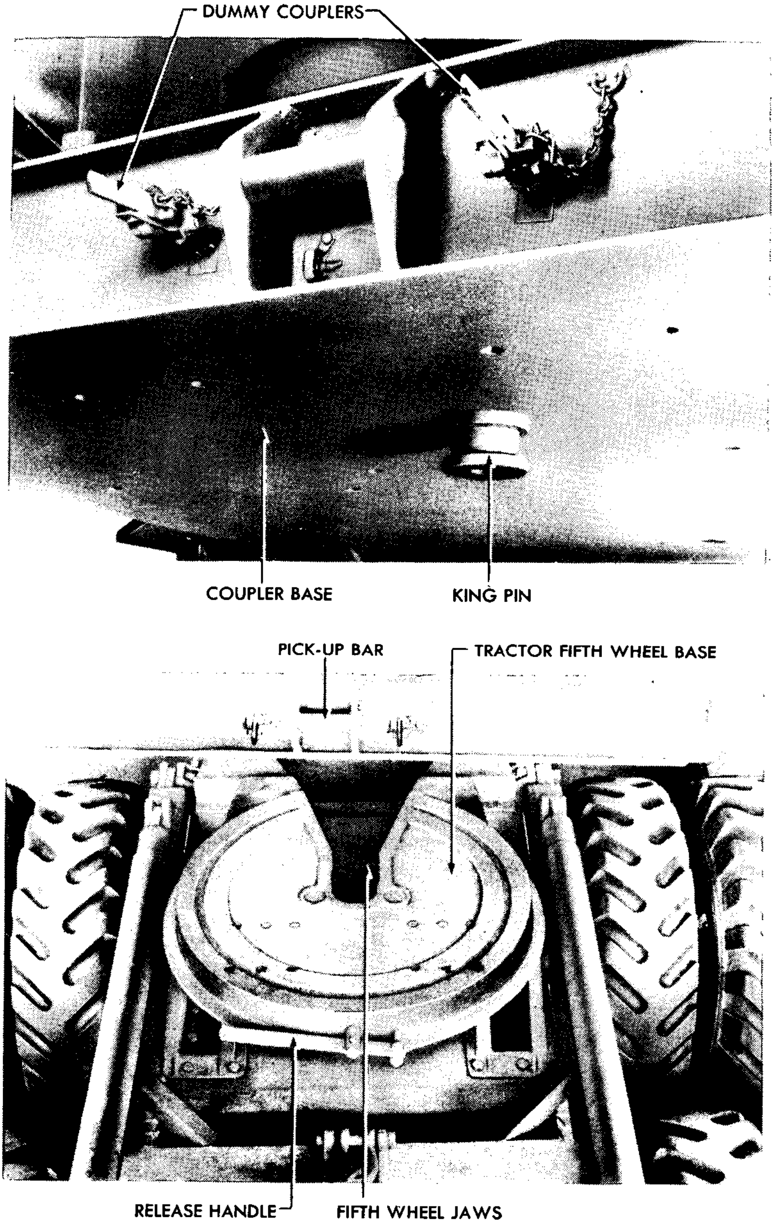
RA PD 77038

*Figure 16—Windshield Armor Plate Latch*

### d. Driving in Combat Area.

(1) WINDSHIELD ARMOR PLATE SHIELDS.

*(a) Close Shields from Inside Cab* (fig. 16). In order to close the shields from inside the cab, it is necessary to remove the thumbscrew and retaining clips that hold the windshield assembly in place, then remove the windshield and place in the windshield racks in the driver's and commander's compartments. Secure the windshield in the racks with the thumbscrew and retaining clips which hold the windshield in the cab. Reach through the windshield opening in the

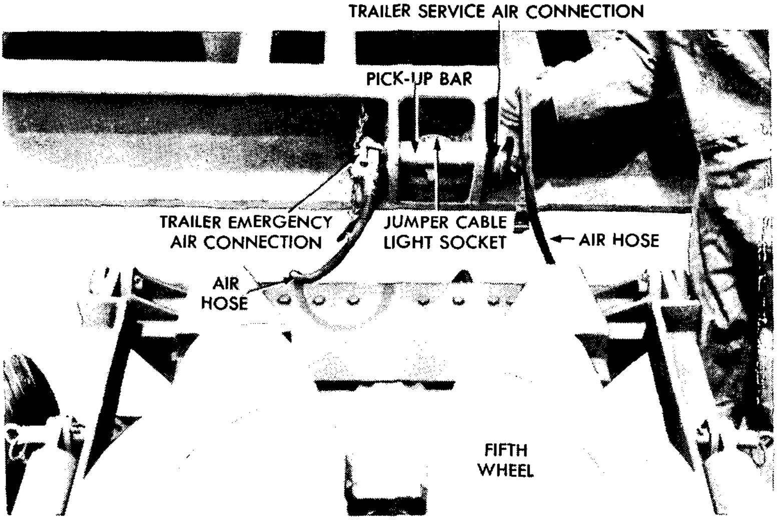

DUMMY COUPLERS
COUPLER BASE
KING PIN
PICK-UP BAR
TRACTOR FIFTH WHEEL BASE
RELEASE HANDLE
FIFTH WHEEL JAWS

RA PD 57469

*Figure 17—Coupling Tractor to Semitrailer*

cab, and press inward on the release button of the latch which holds the armor plate shield to the support rod, and lift the shield up, and off, the rod. Repeat procedure on opposite shield. Push rods up against the cab and allow the armor plate shields to slam shut, thereby latching the shield to the cab by means of the latch bolts.

(b) *To Open Shields from Inside Cab.* To unlatch the shields pull up on the latch pole. Then push the shield up. Push the support rod out and install shield on support rod, making sure the lock button is out. NOTE: *It is possible to close the shields with the windshield in its normal place in the front of the cab. If this is done, the shield can be unlatched by pulling on the eyelet at the end of the chain which is fastened to the shield latch bolt.*


TRAILER SERVICE AIR CONNECTION
PICK-UP BAR
TRAILER EMERGENCY AIR CONNECTION
JUMPER CABLE LIGHT SOCKET
AIR HOSE
AIR HOSE
FIFTH WHEEL

RA PD 77013

***Figure 18—Attaching Air Lines to Semitrailer Before Coupling Tractor and Semitrailer***

(c) *Radiator Armor Plate Doors.* Pulling backward on the radiator door lever, at left side of commander's seat, closes the radiator doors, and pushing the lever forward, opens the doors.

(d) *Door and Cab Window Armor Plate Shields.* Reach through the cab opening and pull the shield up, and slam it shut, so that the latch bolt holds the shield in place. To unlatch the shield pull downward on the latch bolt and push the shield outward and down.

**e. Coupling Semitrailer to Tractor.**

(1) ALINE TRACTOR WITH SEMITRAILER (fig. 17). Back the tractor slowly to the back end of the semitrailer and have an assistant stand at the semitrailer to guide the driving. Maneuver tractor so that the kingpin of the semitrailer is in line with the fifth wheel jaws; and

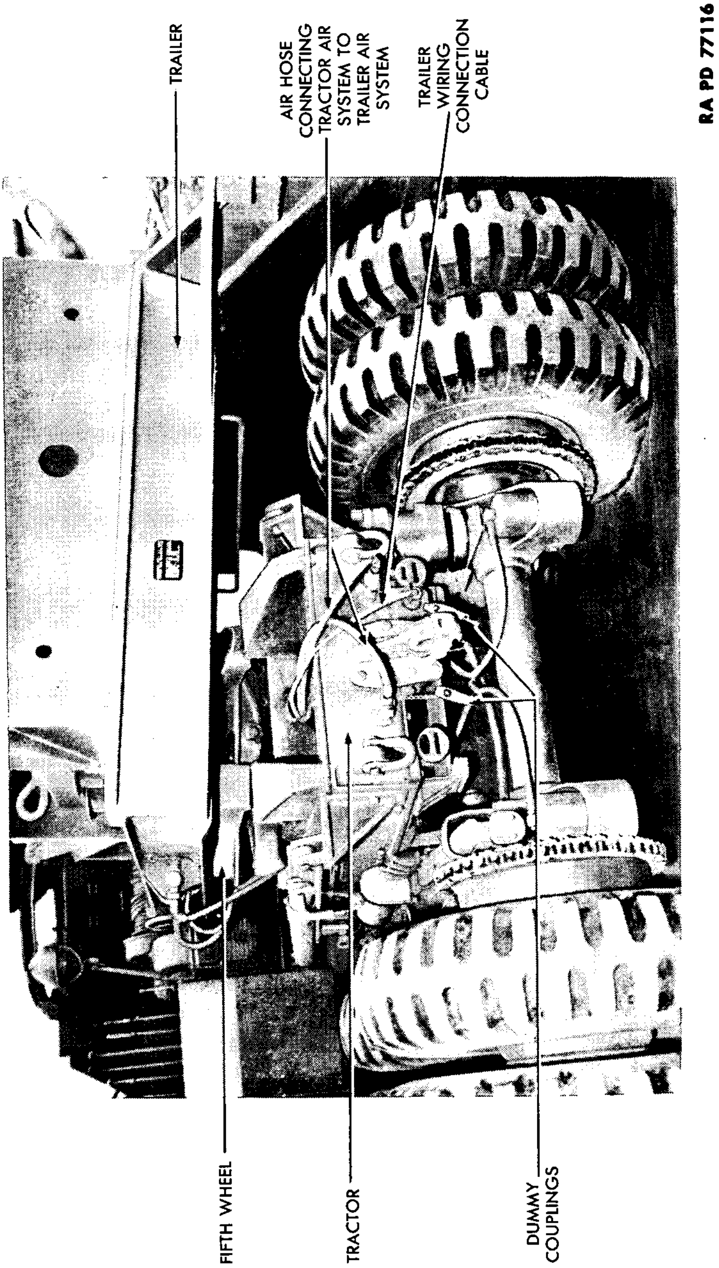

TRAILER
AIR HOSE CONNECTING TRACTOR AIR SYSTEM TO TRAILER AIR SYSTEM
TRAILER WIRING CONNECTION CABLE
RA PD 77116
FIFTH WHEEL
TRACTOR
DUMMY COUPLINGS

*Figure 19—Attaching Air Hose to Tractor*

just before the coupler base starts to ride onto the fifth wheel, stop the tractor.

(2) APPLY TRACTOR BRAKES AND BLOCK SEMITRAILER (figs. 18 and 19). Remove dummy couplings from the semitrailer air connection on the tractor and semitrailer and attach the air hose which is a part of the equipment of the semitrailer. Connect the emergency air connection on tractor to the service air connection on the semitrailer, and connect the service air connection of the tractor to the emergency air connection of the semitrailer. Turn the handle of the tractor air valves on by turning handle at side of tractor. These air valves are located at the front side of the rear cross member of the tractor chassis frame and are accessible through two handholes on the under side cross member. Remove chock blocks from the rear of the semitrailer decking and block the front and rear of the four rear wheels of the semitrailer (fig. 20). At the driver's seat in the tractor pull down on the semitrailer brake hand control in order to apply the semitrailer brakes. Turn off the two air valves at the rear cross member of the tractor chassis frame by pulling the handles, then disconnect and remove the air hose.

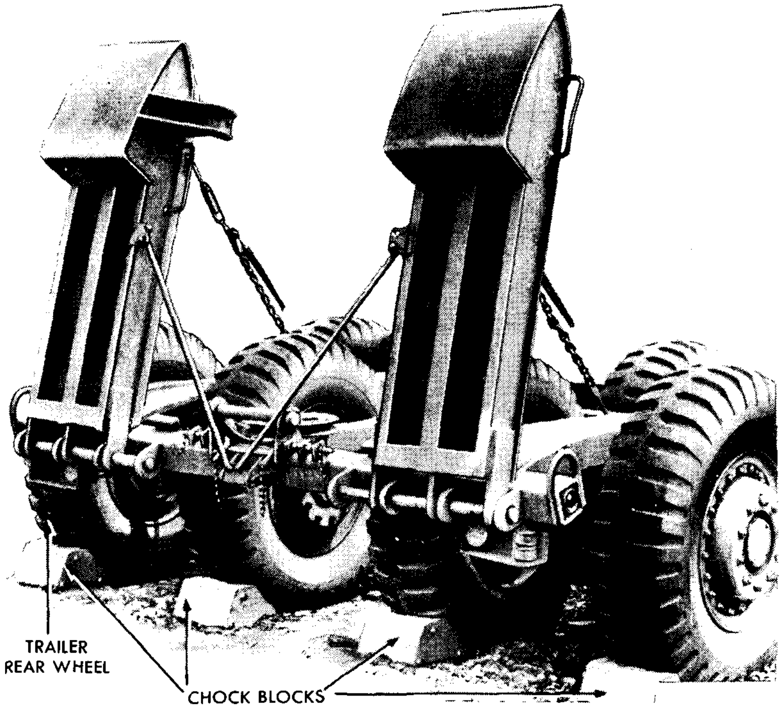
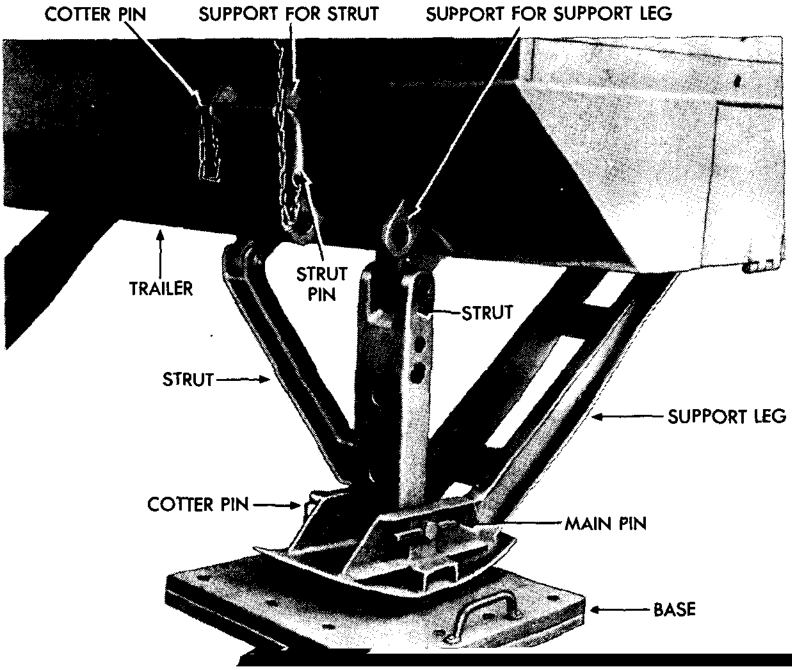


*Figure 20—Blocking Rear Wheels of Semitrailer*

## 40-TON TANK TRANSPORTER TRUCK-TRAILER M25

(3) Attach Tractor to Semitrailer. Cover the fifth wheel and kingpin on the semitrailer with grease and back the tractor to the semitrailer until the kingpin is settled in the fifth wheel jaws. CAUTION: *The fifth wheel jaws must be locked firmly around the kingpin, therefore making certain that the release handle is inward toward the semitrailer with the release handle pin all the way in.* To test if the coupling is complete, start the tractor and try pulling the semitrailer ahead; and if the coupling has been correctly made, movement of the semitrailer will be extremely difficult. Attach jumper wiring


COTTER PIN
SUPPORT FOR STRUT
SUPPORT FOR SUPPORT LEG
TRAILER
STRUT PIN
STRUT
STRUT
SUPPORT LEG
COTTER PIN
MAIN PIN
BASE

e. **Installation** (fig. 158). Install mounting bracket on cab roof and fasten with cap screws and lock washers. Screw upper half of spotlight handle into mounting bracket and then attach lower half of handle to upper half and tighten set screws. Install wiring under clamp and fasten clamp with screw, then attach wire to switch with screw. Install bottom cover and fasten with screws. Install spotlight arm in mounting bracket, then install spotlight on arm and tighten thumb nut. Loosen clamp wing nut to turn light in any position desired, then tighten nut.

## 117. FLOODLIGHTS.

a. **Description** (fig. 159). The two floodlights of the lamp type are mounted on the rear of the cab. They are for field use and each consists of a body, lens, and lamp.

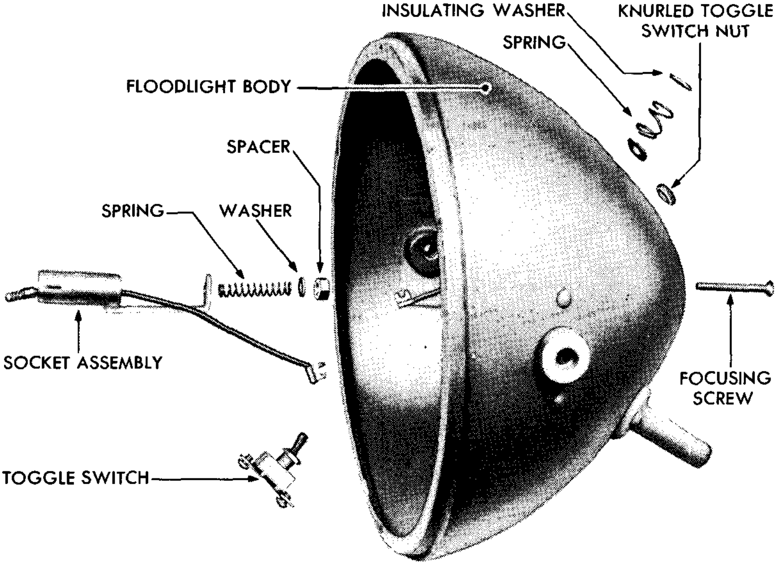

INSULATING WASHER
KNURLED TOGGLE SWITCH NUT
SPRING
FLOODLIGHT BODY
SPACER
SPRING
WASHER
SOCKET ASSEMBLY
FOCUSING SCREW
TOGGLE SWITCH
RA PD 47638

*Figure 160—Floodlight Body—Disassembled*

b. **Maintenance** (fig. 160).

(1) Remove Lamp. Remove screw from bottom side of front of door. Lift off lens and door together. Remove lamp by turning counterclockwise.

(2) Remove Reflector. Remove cork gasket from reflector. Remove three screws that hold reflector to body of light. Lift off reflector.

(3) Remove Mounting Bracket. Remove nuts and lock washers from inner ends of two bolts. Loosen clamp screw. Remove

bolts. Lift off mounting bracket assembly. Remove bracket by taking off self-locking nut. Remove spacer and spring washer from mounting arm. Remove bracket from mounting arm.

(4) REMOVE SWITCH. Remove lamp socket by first disconnecting wire from toggle switch body, then unscrewing focusing screw from outside back of body. Remove spring, washer, and spacer. Disconnect intake wire from toggle switch body. Remove knurled nut from toggle switch on outside of body. Remove switch from inside of body.

(5) INSTALL SWITCH. Install toggle switch by inserting from inside of body, fastening with knurled nut on outside. Insert focusing screw through hole in rear end of body and hold in place with the fingers. Place spacer, washer, and spring over screw. Hold socket assembly in place while screwing focusing screw into tapped hole in end of socket mounting arm. Connect wire from socket to switch body. Connect intake wire to other post on switch body. Clamp post of mounting arm in vise with soft jaws. Place body between ends of mounting arm. Install bolts through arm and into body.

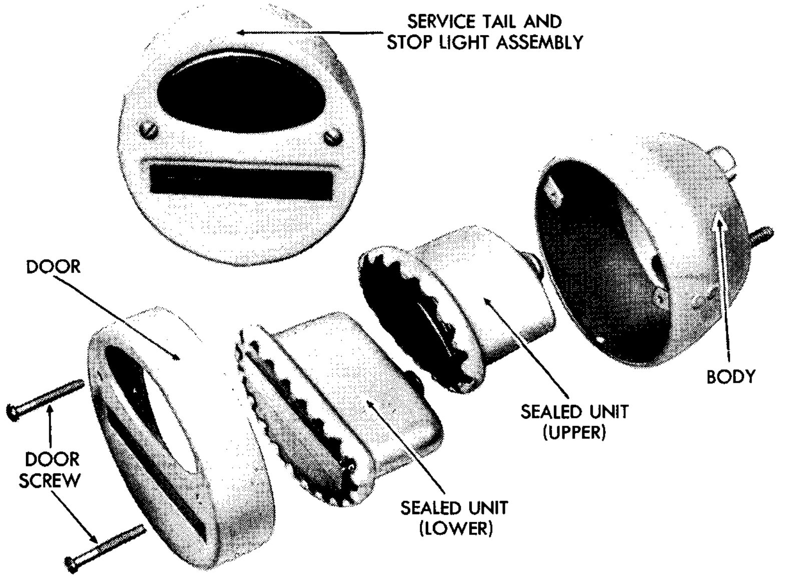


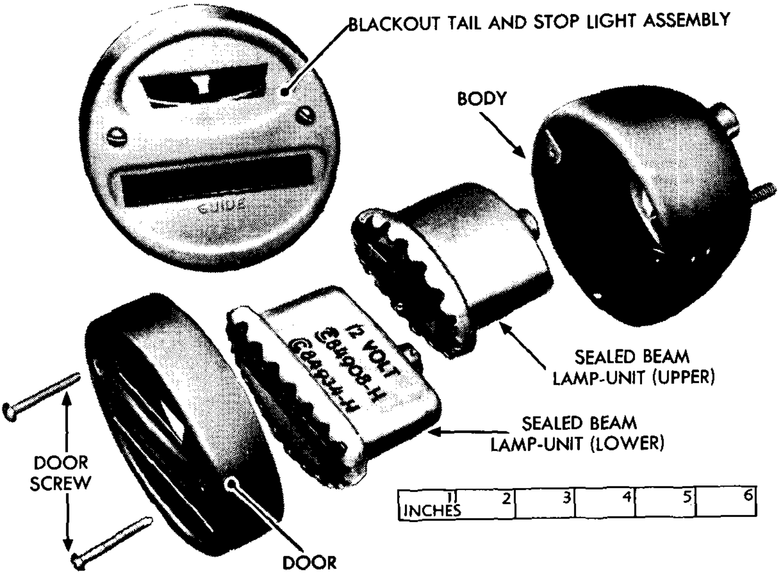
*Figure 161—Service Tail and Stop Light—Disassembled*

(6) INSTALL LAMP AND REFLECTOR. Turn socket assembly so that mounting arm is at top. Place reflector over socket with slot in reflector sleeve over end of mounting arm. Install three small screws that hold reflector to body. NOTE: *Tapped hole in bottom edge of light body should line up with notch in rim of reflector. Install lamp by pressing inward while turning clockwise.*

(7) INSTALL LENS. Install cork gasket, fastening in place with small quantity of shellac at four spots. Assemble lens to door, being sure top of lens is at opposite side of door from mounting screw hole. Fasten lens in with clips. Assemble lens to light body by hooking edge of door over lugs in top of front of body and lining up screw hole in door with tapped hole in bottom of face of body. Install door screw and tighten.

(8) ASSEMBLE BRACKET TO MOUNTING ARM. Insert post of mounting arm through bracket. Place spring washer and spacer over lower end of post. Fasten with self-locking nut.

c. **Removal.** Pull wiring connector out of light, then remove nuts, spacers and spring washers which hold light to bracket and lift lights out of brackets.


BLACKOUT TAIL AND STOP LIGHT ASSEMBLY
BODY
SEALED BEAM LAMP-UNIT (UPPER)
SEALED BEAM LAMP-UNIT (LOWER)
12 VOLT
DOOR SCREW
DOOR
INCHES
1
2
3
4
5
6

RA PD 48103

*Figure 162—Blackout Tail and Stop Light—Disassembled*

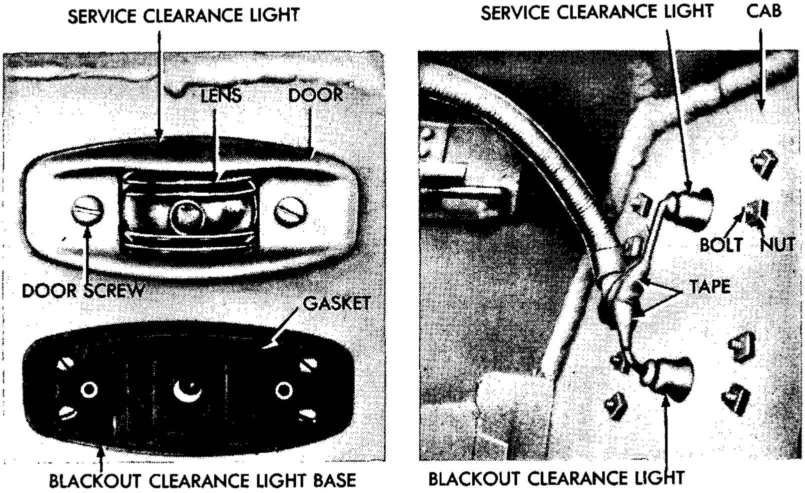
d. **Installation.** Install floodlights in brackets and then install spring washers, spacers, and nuts which hold lights to brackets. Install wiring connectors.

## 118. SERVICE TAIL AND STOP LIGHT.

a. **Description** (fig. 161). The service tail and stop light is used for normal driving conditions and is located on the rear of the chassis frame. The light consists of a body, door, and sealed beam lamp-unit.

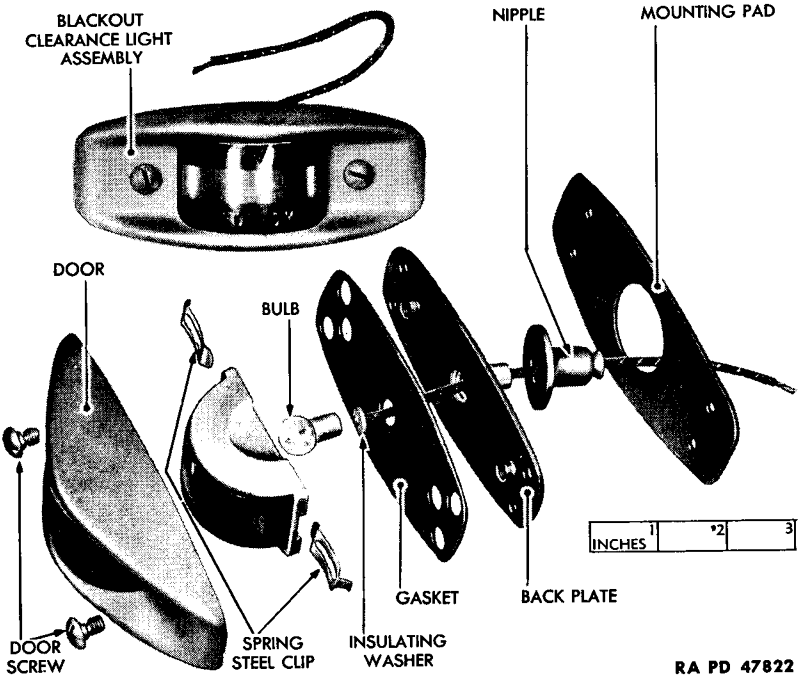
b. **Maintenance** (fig. 161). Remove two screws and take off door, then remove sealed unit (upper or lower) and replace.

## 40-TON TANK TRANSPORTER TRUCK-TRAILER M25


SERVICE CLEARANCE LIGHT
LENS
DOOR
DOOR SCREW
GASKET
BLACKOUT CLEARANCE LIGHT BASE
SERVICE CLEARANCE LIGHT
CAB
BOLT
NUT
TAPE
BLACKOUT CLEARANCE LIGHT

RA PD 77015

*Figure 163—Service and Blackout Clearance Lights and Connections*


BLACKOUT CLEARANCE LIGHT ASSEMBLY
NIPPLE
MOUNTING PAD
DOOR
BULB
INCHES 1 2 3
GASKET
BACK PLATE
DOOR SCREW
SPRING STEEL CLIP
INSULATING WASHER

RA PD 47822

*Figure 164—Blackout Clearance Light—Disassembled*

**c. Removal** (fig. 161). Pull wiring connector out of light, then remove two nuts and lock washers which hold light to chassis frame and remove light.

**d. Installation** (fig. 161). Install light and fasten with two nuts and lock washers, then install wiring connector in light.

## 119. BLACKOUT TAIL AND STOP LIGHT.

**a. Description** (fig. 162). The blackout tail and stop light is used when driving under the blackout conditions and is located on the rear of the chassis frame. The light consists of a body, door, and two sealed beam lamp-units.

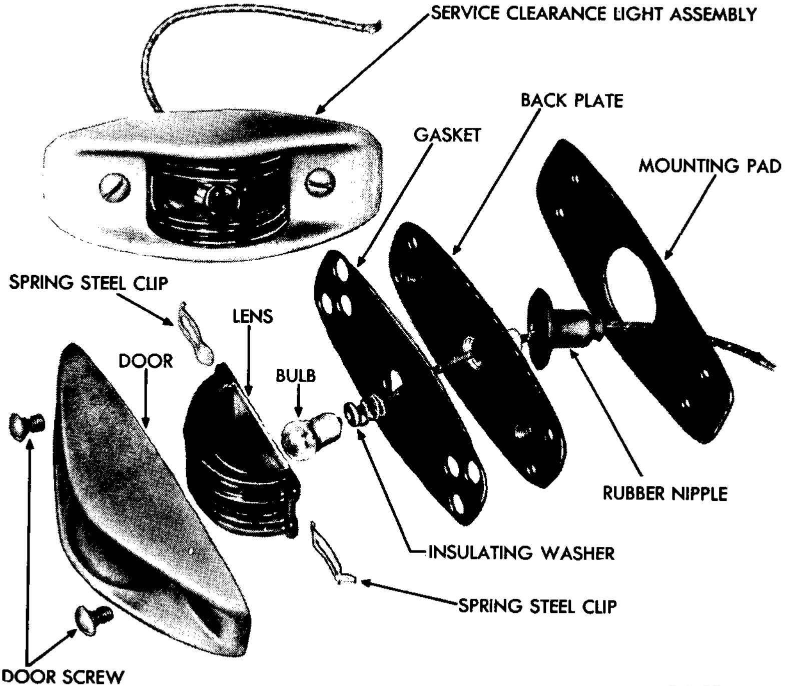

SERVICE CLEARANCE LIGHT ASSEMBLY
BACK PLATE
GASKET
MOUNTING PAD
SPRING STEEL CLIP
LENS
DOOR
BULB
RUBBER NIPPLE
INSULATING WASHER
SPRING STEEL CLIP
DOOR SCREW
RA PD 47659

*Figure 165—Service Clearance Light—Disassembled*

**b. Maintenance** (fig. 162). Remove two screws that hold door to body and remove two sealed units from body.

**c. Removal** (fig. 162). Pull wiring connector out of light and remove two nuts and lock washers that hold light to bracket. Remove light.

**d. Installation** (fig. 162). Install light on bracket and fasten with two nuts and lock washers. Install wiring connector in light.

## 120. SERVICE AND BLACKOUT CLEARANCE LIGHTS.

**a. Description** (fig. 163). The service clearance lights and blackout clearance lights are to provide a means of judging the extreme width of the vehicle for passing or parking. The procedure for removal and installation is the same. The lights are secured to the upper front sides of the cab and consist of a door, base, and lamp.

**b. Maintenance** (figs. 164 and 165). Take out two screws that hold door to back plate. Lift off door with glass lens. Remove two spring steel door screws and retaining clips by pushing outward until lens can be lifted out of door. Move clips inward and lift off screws. Remove lamp by turning counterclockwise while pressing lamp inward. Lift off gasket and push wire through lamp opening. Remove wire and spring out of back plate and rubber nipple. Install wire and spring in back plate, install rubber nipple. Push wire through lamp opening, then install gasket. Install lamp, then clips on screws. Install lens and fasten with two steel door screws and retaining clips. Install door and fasten with two screws.

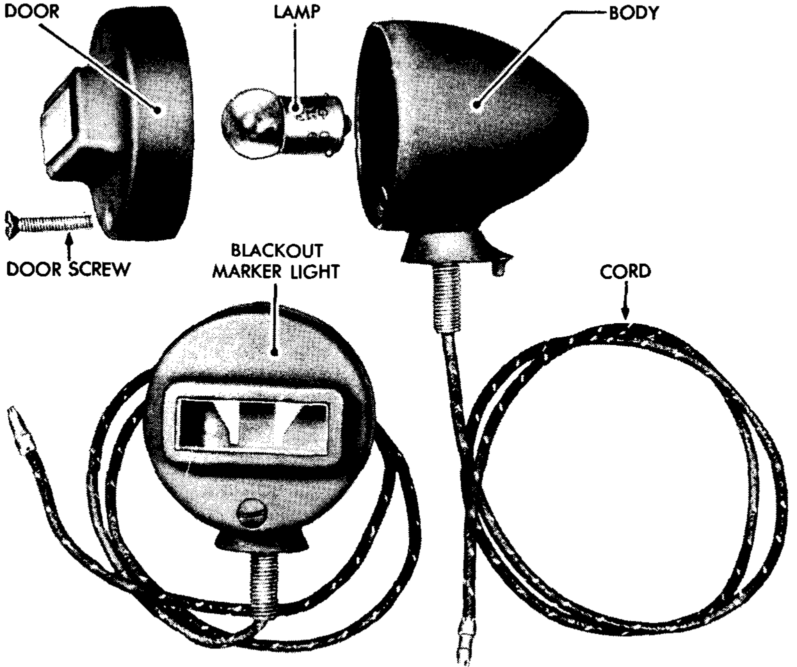
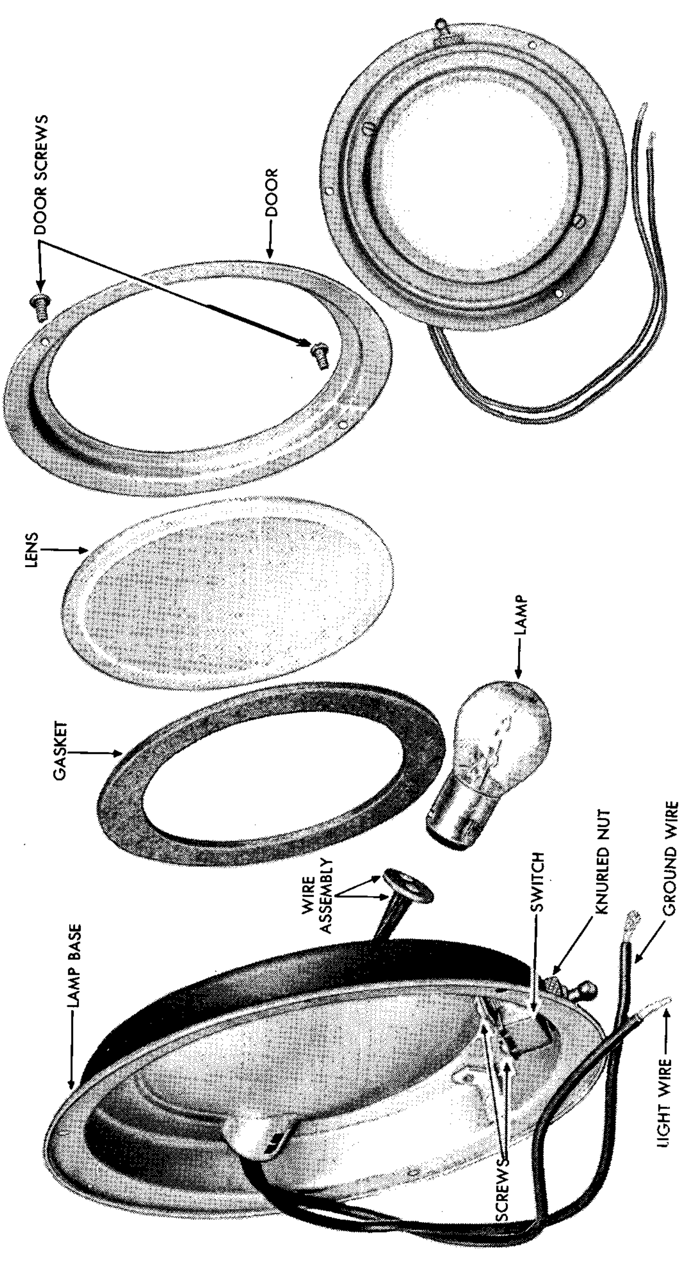


*Figure 166—Blackout Marker Light*

**c. Removal** (fig. 163). Remove two screws which hold door to cab and remove door. Remove lamp and remove door gasket. From inside cab remove tape from service clearance light wire and then


DOOR SCREWS
DOOR
LENS
GASKET
LAMP
LAMP BASE
WIRE ASSEMBLY
SWITCH
KNURLED NUT
GROUND WIRE
LIGHT WIRE
SCREWS

RA PD 75276

Figure 167—Dome Light—Disassembled

remove grommet from wire. Push wire through cab and remove wire. Remove four bolts, nuts, and lock washers which hold base and remove base and gasket.

**d. Installation** (fig. 163). Install base and gasket on cab and fasten with four bolts, nuts, and lock washers. Push wire through cab and install grommet. Connect wires inside cab and tape connection. Install lamp and cover gasket. Install cover and fasten with two screws.

## 121. BLACKOUT MARKER LIGHT.

**a. Description** (fig. 166). The blackout marker lights are located in the front bumper. The light consists of a body, door, and lamp.

**b. Maintenance** (fig. 166). Remove screw that holds door to body and remove door. Remove lamp. Install lamp and then install door. Fasten door to body with screw.

**c. Removal** (fig. 166). Disconnect wiring at main junction block. Remove nuts and lock washers that hold light to bumper and remove light.

**d. Installation.** Install lights on front bumper and fasten with nuts and lock washers. Connect wiring at main junction block (wiring diagram, fig. 140).

## 122. DOME LIGHT.

**a. Description** (fig. 167). The dome light in the center of the cab roof is operated by a switch located on the light. The light consists of a base, door, and lamp.

**b. Maintenance** (fig. 167). Remove two door screws and toothed lock washers. Take off door, lens, and gasket from lamp base. Remove lamp by pressing inward and turning counterclockwise. Remove screws from light wire and ground wire from switch base. Remove knurled nut from outside of switch. Remove switch from inside of lamp base. Pull wire assembly out of base. Install wire assembly in base. Install switch in base end; fasten with knurled nut. Attach light wire and ground wire in base and fasten with screws. Install lamp, then install gasket, lens, and door. Fasten with two screws and washers.

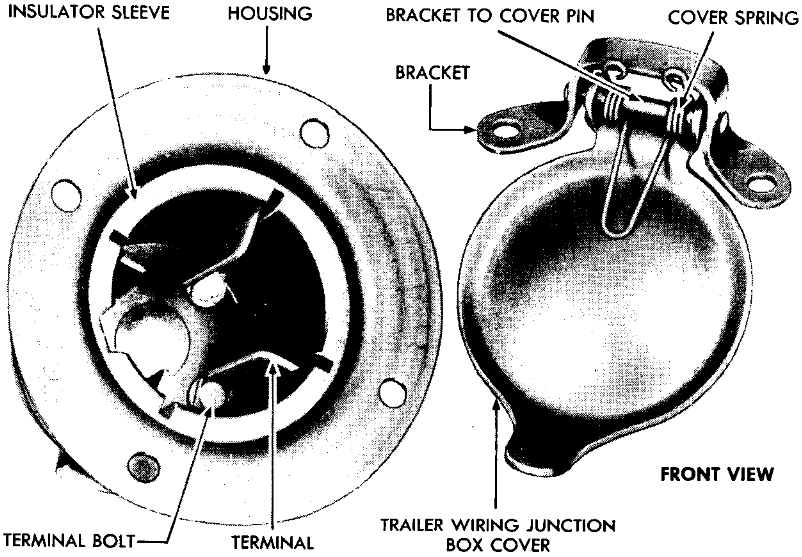
**c. Removal.** Remove three bolts, nuts, and lock washers that hold dome light to cab, pull light downward and disconnect wires.

**d. Installation.** Install wires and then install light and fasten with three bolts, nuts, and lock washers.

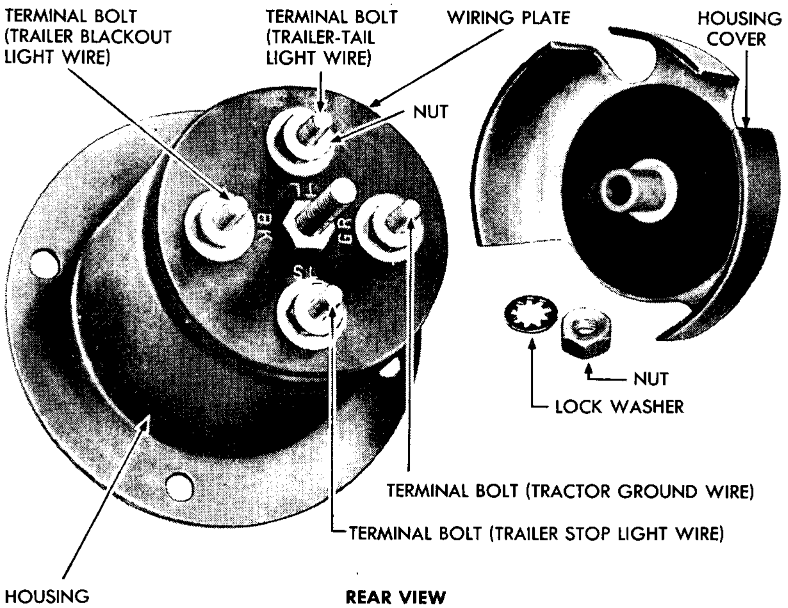
## 123. SEMITRAILER WIRING JUNCTION BOX.

**a. Description** (fig. 168). The semitrailer wiring junction box is at the rear of the tractor. A cable to join the junction box to the semitrailer is carried on the semitrailer and is used to join the tractor and semitrailer lighting systems. The box consists of a body with a hinged cover and contains the wiring terminals.

**b. Maintenance** (fig. 168). Drive bracket to cover and bracket and remove semitrailer wiring junction box cover from trailer wiring


INSULATOR SLEEVE
HOUSING
BRACKET TO COVER PIN
COVER SPRING
BRACKET
TERMINAL BOLT
TERMINAL
TRAILER WIRING JUNCTION BOX COVER

FRONT VIEW


TERMINAL BOLT (TRAILER BLACKOUT LIGHT WIRE)
TERMINAL BOLT (TRAILER-TAIL LIGHT WIRE)
WIRING PLATE
HOUSING COVER
NUT
TL
BK
GR
SL
NUT
LOCK WASHER
TERMINAL BOLT (TRACTOR GROUND WIRE)
TERMINAL BOLT (TRAILER STOP LIGHT WIRE)
HOUSING

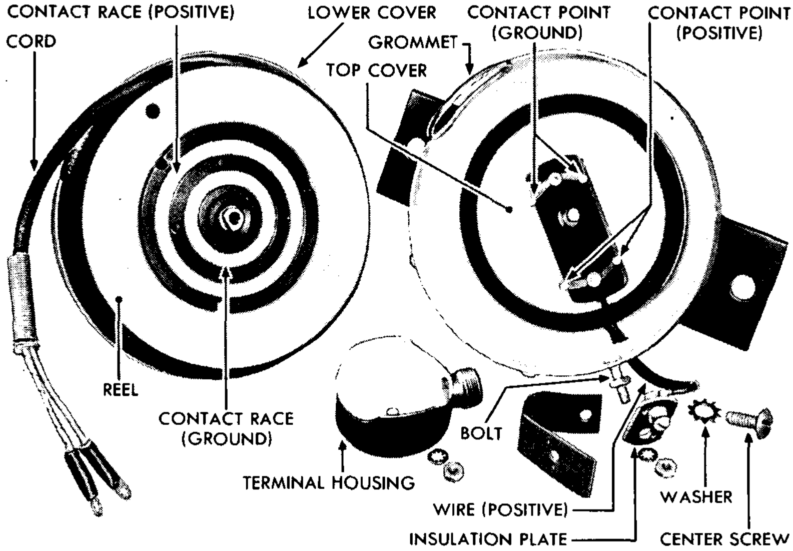
REAR VIEW

RA PD 75265

*Figure 168—Semitrailer Wiring Junction Box and Cover*

junction box along with cover spring and bracket. Install bracket to cover pin through one side of semitrailer wiring junction box cover and bracket and then install cover spring on pin. Push pin through opposite side of cover and bracket, then rivet pin onto cover.

c. **Removal.** Remove housing cover bolt, nut, and lock washer, then remove cover. Remove four nuts from terminal bolts and then remove another four nuts. Remove four wire clips and semitrailer taillight wire, tractor ground wire (grounds to stop light mounting bolt), semitrailer stop light wire, and semitrailer blackout light wires from terminal bolts. Remove four bolts, nuts, and lock washers which hold semitrailer wiring junction box and semitrailer wiring junction box cover to chassis frame bracket. Remove box assembly and cover assembly.


CONTACT RACE (POSITIVE)
CORD
LOWER COVER
GROMMET
TOP COVER
CONTACT POINT (GROUND)
CONTACT POINT (POSITIVE)
REEL
CONTACT RACE (GROUND)
TERMINAL HOUSING
BOLT
WIRE (POSITIVE)
INSULATION PLATE
WASHER
CENTER SCREW

RA PD 47831

*Figure 169—Signal Light Reel—Disassembled*

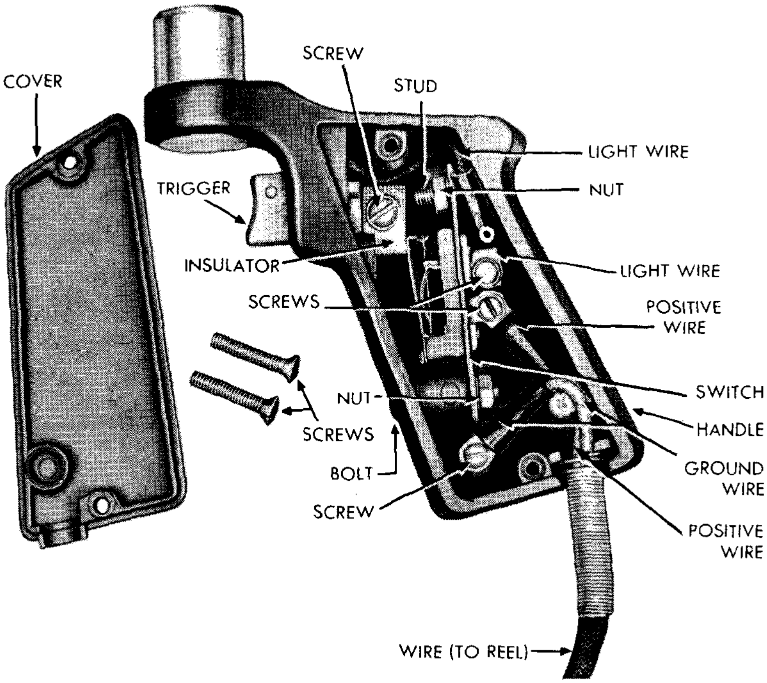
d. **Installation.** Install semitrailer taillight wire, semitrailer blackout light wire, tractor ground wire (grounds to stop light mounting bolt), semitrailer stop light wire on terminal bolts, then install four wire nuts on terminal bolts and then install another four nuts on bolts.

## 124. SIGNAL LIGHT REEL AND SWITCH.

a. **Description** (figs. 169 and 170). The signal light reel and switch are located on the inside roof of the cab and are the means of using the combination blinker and spotlight at a distance from the vehicle.

**b. Maintenance** (figs. 169 and 170).

(1) REEL. Take out center screw and star washer. Remove top cover from body. Allow reel to unwind itself. Remove metal grommet from cord outlet spring. Wind wiring onto reel, being careful not to allow wiring to kink or twist. Wind reel about five turns to put tension on spring. Holding reel and lower cover together with spring under this tension, shake assembly until spring stop falls into place. NOTE: *The action of this spring is similar to that of an ordinary window shade roller.* Place metal grommet over wiring and in position between two covers. Place covers together. Fasten with screw and toothed lock washer through top cover and into reel.


COVER
SCREW
STUD
LIGHT WIRE
NUT
TRIGGER
INSULATOR
LIGHT WIRE
SCREWS
POSITIVE WIRE
SWITCH
NUT
HANDLE
SCREWS
GROUND WIRE
BOLT
SCREW
POSITIVE WIRE
WIRE (TO REEL)

RA PD 75336

*Figure 170—Signal Switch Assembly—Cover Removed*

(2) SWITCH.

*(a) Removal.* Take out two screws that hold cover to handle and lift off cover. Remove screws that hold ground and positive wires to handle and remove wires. Remove screw that holds light wire to handle and remove wire. Remove screw and lock washer

that hold insulator and remove insulator, then lift trigger and spring out of handle. Remove nut and lock washer from bolt which holds switch and remove bolt from handle. Remove nut and lock washer from front stud which holds switch and remove switch.

*(b) Installation.* Install switch and secure with nut and lock washer, then install bolt, nut, and lock washer that hold switch on handle. Install trigger and spring in handle, then install insulator and secure with screw and lock washer. Install light wire and secure to handle with screw. Install ground and positive wires on handle and secure with screws. Install cover on handle and secure with two screws.

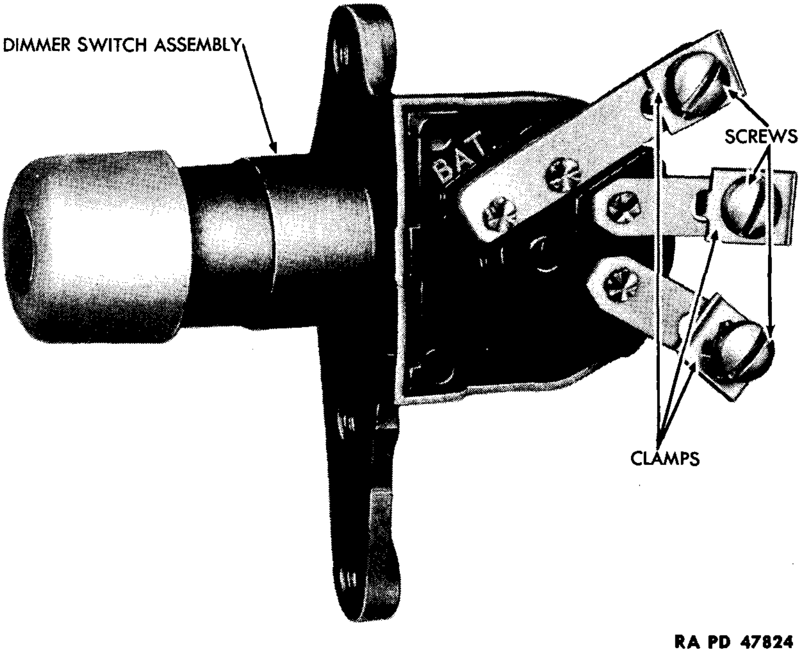


*Figure 171—Dimmer Switch*

**c. Removal of Reel.** Remove nut and washer that hold terminal housing on reel and disconnect wire. Remove two cap screws and lock washers that hold reel on cab, then repeat procedure on switch. Remove reel and switch.

**d. Installation of Reel.** Install reel and switch and fasten with four cap screws and lock washers. Connect wire to reel, then install terminal housing and fasten with nut and washer.

## 125. DIMMER SWITCH.

**a. Description** (fig. 171). The dimmer switch operates the high or low beam of the headlights and is located on the floor of the cab. The switch is of the plunger type.

**b. Removal.** Remove two screws and lock washers which hold dimmer switch to floorboard. From underneath floorboard, remove three screws and clamps which hold three wires to dimmer switch and remove dimmer switch from floorboard.

**c. Installation.** From underneath floorboard install dimmer switch in floorboard and from top of floorboard fasten switch with two screws and lock washers. From underneath floorboard install three wires on dimmer switch and fasten with three clamps and screws.

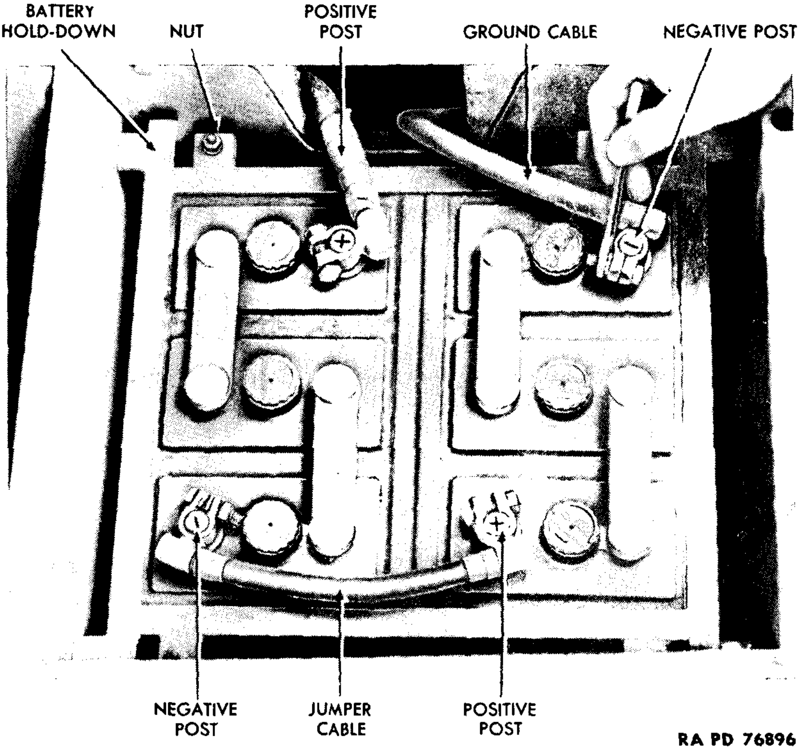

BATTERY HOLD-DOWN
NUT
POSITIVE POST
GROUND CABLE
NEGATIVE POST
NEGATIVE POST
JUMPER CABLE
POSITIVE POST
RA PD 76896

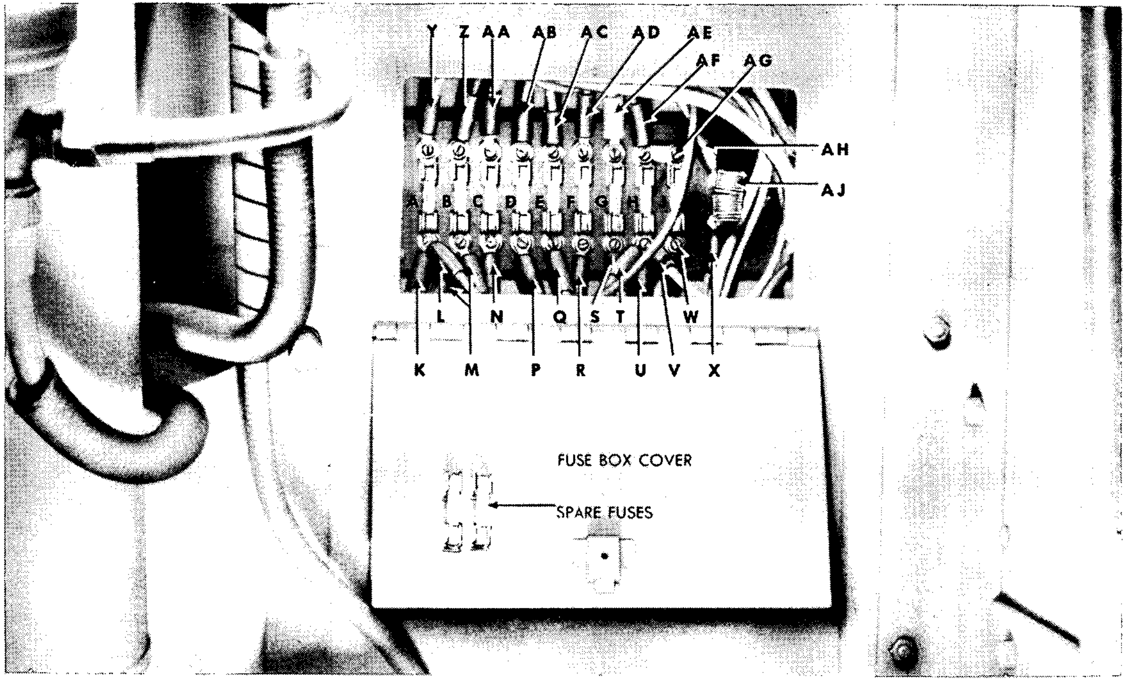
*Figure 172—Disconnecting Battery*

## 126. COMMANDER'S DESK LIGHT.

**a. Description.** The light over the commander's desk is a hooded, bulb-type light.

**b. Removal.** Pull hood (over lamp) off light. Remove lamp, then remove switch handle. Push socket up through light and melt solder that holds wire to lamp connector. Pull wire out of light, then remove nut and lock washer that hold light to cab bracket.

**c. Installation.** Install light on cab bracket and fasten with nut and lock washer. Push wire up through light and solder wire to lamp


Y
Z
AA
AB
AC
AD
AE
AF
AG
AH
AJ
A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W
X
FUSE BOX COVER
SPARE FUSES

RA PD 76999

Figure 173—Fuse Box (Below Instrument Panel)

**FUSES**—

**A**—FUSE FOR HEADLIGHTS, SERVICE CLEARANCE LIGHTS (TRACTOR AND TRAILER), SERVICE TAIL (TRACTOR AND TRAILER)
**B**—BLACKOUT MARKER AND BLACKOUT TAIL (TRACTOR AND TRAILER)
**C**—TRAILER TAILLIGHT
**D**—STOP LIGHTS (TRACTOR AND TRAILER)
**E**—FUEL GAGES
**F**—LOW PRESSURE AIR INDICATOR
**G**—SIREN MOTOR
**H**—SIREN LIGHT, DOME LIGHT, READING LIGHT, WINDSHIELD MOTORS
**J**—SPOT LIGHT REEL

* * *

**K**—CAB JUNCTION BLOCK AND HEADLIGHTS
**L**—TAIL AND STOP LIGHT
**M**—BLACKOUT MARKER AND BLACKOUT TAILLIGHT
**N**—TRAILER JUNCTION BOX (TO TRAILER TAILLIGHTS)
**P**—STOP LIGHT SWITCH
**Q**—FUEL GAGES
**R**—LOW PRESSURE AIR INDICATOR
**S**—SIREN MOTOR
**T**—SIREN LIGHT
**U**—DOME LIGHT, READING LIGHT, WINDSHIELD MOTORS
**V**—TOOL BOX LIGHT
**W**—SPOTLIGHT REEL
**X**—BLACKOUT DRIVING LIGHT
**Y**—TO "HT" TERMINAL ON LIGHT SWITCH
**Z**—TO "BHT" TERMINAL ON LIGHT SWITCH
**AA**—TO "BHT" TERMINAL ON LIGHT SWITCH
**AB**—TO STOP LIGHT SWITCH
**AC**—TO LEFT IGNITION SWITCH
**AD**—TO RIGHT IGNITION SWITCH
**AE**—TO SIREN SWITCH
**AF**—TO AMMETER
**AG**—TIED TO "W"
**AH**—BLACKOUT DRIVING LIGHT SWITCH
**AJ**—RESISTOR

RA PD 76999A

***Legend for Figure 173—Fuse Box (Below Instrument Panel)***

connector, then push wire back through light. Install switch handle, lamp, and hood.

## 127. BATTERY.

a. **Description** (fig. 172). There are two storage batteries located under the crew seat on the right rear wall of the cab. These are six-volt batteries connected in series.

b. **Removal** (fig. 172). Remove right rear crew seat cushion and seat pan. Disconnect ground cable and positive cables from battery posts. Remove jumper cable from batteries and then remove nuts that retain battery hold-down and remove hold-down. Lift two batteries out of battery box.

c. **Installation** (fig. 172). Install two batteries and connect jumper cable from positive to negative posts (fig. 172). Connect ground and positive cables and then install battery hold-down, fastening with nuts. Install seat pan and right rear crew seat cushion.

## 128. FUSES.

a. **Description** (fig. 173). The fuse box is located to the right of the steering column and just below the instrument panel. The fuses and the circuits fused are shown on the wiring diagram (fig. 140). There are two fuses on the inside of the fuse box cover.

b. **Removal** (fig. 173). Pull fuse out of clips on fuse block.

c. **Installation** (fig. 173). Install fuse into clips on fuse block.

## Section XX

# MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

| | Paragraph |
|---|---|
| Description and data | 129 |
| Main transmission interlock controls and linkage | 130 |
| Main transmission | 131 |
| Auxiliary transmission controls and linkage | 132 |
| Auxiliary transmission | 133 |
| Transfer case | 134 |
| Declutch assembly, controls, and linkage | 135 |
| Side mounting to auxiliary transmission power take-off and linkage | 136 |
| Top mounting to auxiliary transmission power take-off and linkage | 137 |

## 129. DESCRIPTION AND DATA.

**a. Description.** The main transmission and clutch are located at the rear of the engine. A propeller shaft transmits power from the main transmission to the auxiliary transmission, which is located at the rear of the main transmission, and secured to the frame beneath the rear tandem winch assembly. The transfer case is secured to the rear of the auxiliary transmission. The declutch assembly is secured to the left-hand front side of the transfer case and is connected by a propeller shaft to the front differential and carrier assembly at the front axle, thus providing a means of obtaining front wheel drive when desired. A power take-off assembly is mounted on the right-hand side of the auxiliary transmission and drives the front mounted winch. A second power take-off assembly, mounted on the top of the auxiliary transmission, supplies power to drive the two winches of the tandem winch assembly. A propeller shaft from the transfer case to the rear differential and carrier assembly transmits power to drive the rear wheels through the jackshaft axle shafts.

**b. Data.**

(1) TRANSFER CASE.

| | |
|---|---|
| Make | Timken |
| Model | T96 |

(2) DECLUTCH UNIT.

| | |
|---|---|
| Make | Timken |
| Model | T77 |

(3) AUXILIARY TRANSMISSION.

| | |
|---|---|
| Make | Spicer |
| Model | 703 Special |

(4) SIDE MOUNTED POWER TAKE-OFF.

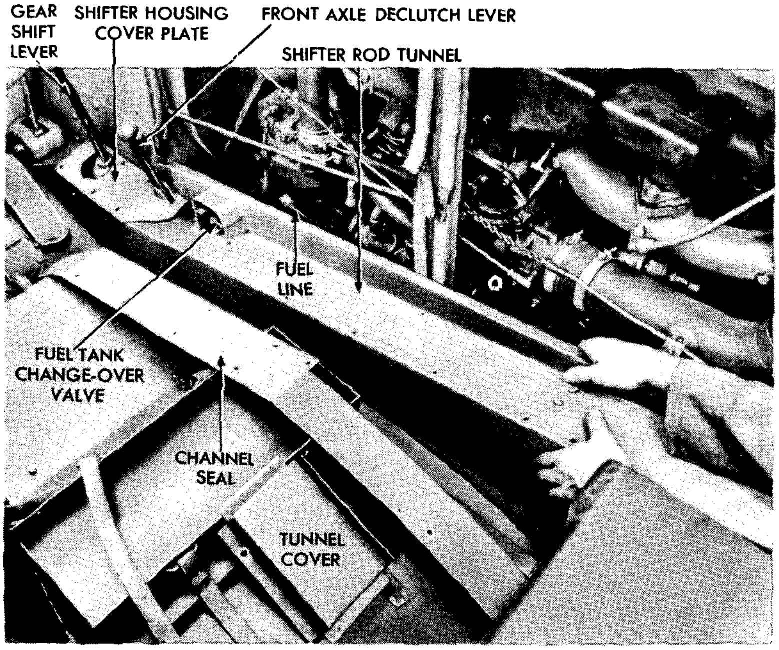
| | |
|---|---|
| Make | Spicer |
| Model | ZG5 |

(5) Top Mounted Power Take-off.

| | |
|---|---|
| Make | Spicer |
| Model | 703 |

(6) Main Transmission.

| | |
|---|---|
| Make | Fuller |
| Model | 4B86 |


GEAR SHIFT LEVER
SHIFTER HOUSING COVER PLATE
FRONT AXLE DECLUTCH LEVER
SHIFTER ROD TUNNEL
FUEL LINE
FUEL TANK CHANGE-OVER VALVE
CHANNEL SEAL
TUNNEL COVER

RA PD 77021

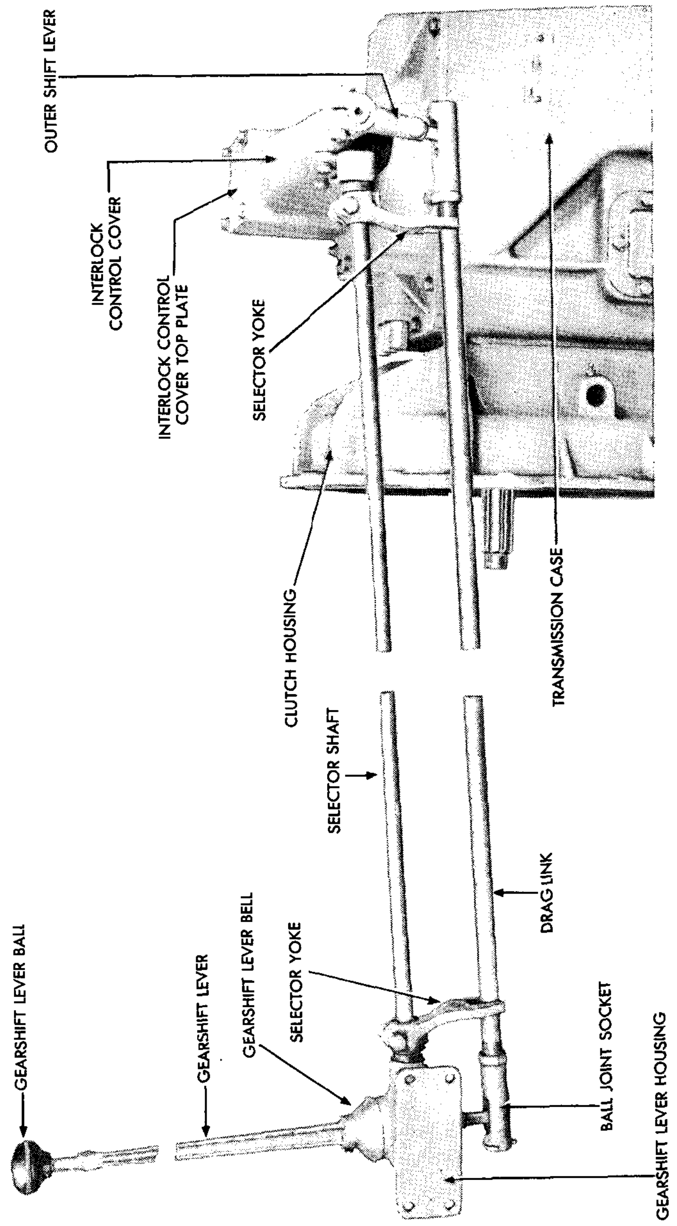
*Figure 174—Removal of Shifter Rod Tunnel*

## 130. MAIN TRANSMISSION INTERLOCK CONTROLS AND LINKAGE.

a. **Description.** The linkage necessary to connect the gearshift lever to the main transmission is located in a box-shaped housing (tunnel). This housing is secured to the cab floor at the left side of the engine. The linkage consists of a selector shaft and drag link which are connected to the gearshift lever at one end and to the transmission interlock control at the opposite end. The drag link and selector shaft are interconnected by means of two selector yokes secured to the front and rear of the selector shaft.

b. **Removal** (figs. 174 and 175).

(1) Preliminary Instructions. Remove the engine front side cover and driver's seat (par. 194); water can from back of driver's seat; co-driver's seat (par. 194); and crew seat at left rear of cab (par. 194).

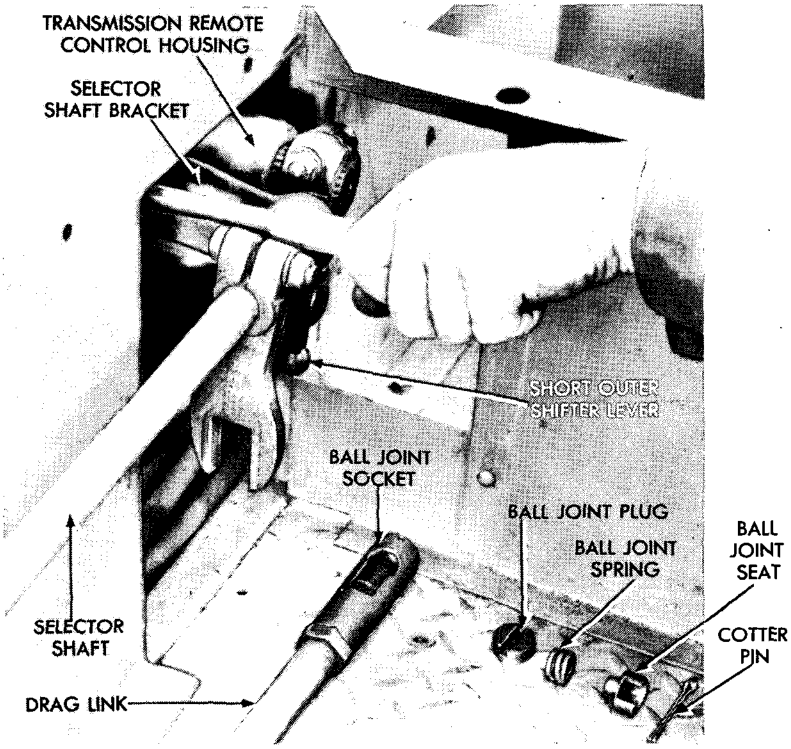

OUTER SHIFT LEVER
INTERLOCK CONTROL COVER
INTERLOCK CONTROL COVER TOP PLATE
SELECTOR YOKE
CLUTCH HOUSING
TRANSMISSION CASE
SELECTOR SHAFT
DRAG LINK
GEARSHIFT LEVER BALL
GEARSHIFT LEVER
GEARSHIFT LEVER BELL
SELECTOR YOKE
BALL JOINT SOCKET
GEARSHIFT LEVER HOUSING

RA PD 74862

*Figure 175—Transmission Interlock Controls*

(2) Remove Channel Seal (fig. 174). Remove channel seal from between wheel housing and shifter rod tunnel by removing four bolts, nuts, and lock washers which hold seal to tunnel. Remove eight cap screws and lock washers and one bolt, nut, and lock washer which hold seal to wheel housing. Lift channel seal off wheel housing.

(3) Loosen Shifter Rod Tunnel (fig. 174). Remove six cap screws and lock washers which hold shifter housing cover plate to tunnel and shifter housing cover. Remove four cap screws and lock washers which hold tunnel to transmission cover. Remove two bolts, nuts, and lock washers which hold tunnel to seat support. Remove seven cap screws and lock washers and one bolt, nut, and lock washer which hold tunnel to floor. Remove two cap screws and lock washers which hold front end of tunnel to shifter housing cover.


TRANSMISSION REMOTE CONTROL HOUSING
SELECTOR SHAFT BRACKET
SHORT OUTER SHIFTER LEVER
BALL JOINT SOCKET
BALL JOINT PLUG
BALL JOINT SPRING
BALL JOINT SEAT
COTTER PIN
SELECTOR SHAFT
DRAG LINK

RA PD 76955

*Figure 176—Disconnecting Selector Shaft Bracket from Remote Control Housing*

(4) Disconnect Fuel Lines. From the engine side of the tunnel, disconnect the three fuel lines from the fuel tank change-over valve.

(5) Disconnect Gearshift Lever and Front Axle Declutch Lever and Remove Tunnel (fig. 175). Place the gearshift lever in

## MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

reverse position and remove the cotter pin and straight pin which hold the front axle declutch lever to the shifter housing cover plate. Lift the plate up as far as possible on the two levers. Then pull the tunnel forward as far as possible and lift the rear end free of the seat support. The tunnel can then be lifted from the vehicle. Remove the shifter rod tunnel cover, which has been disconnected. Remove the cotter pin and clevis pin from the bottom of the declutch lever to free the lever from the clevis yoke and remove the lever and shifter housing cover plate.

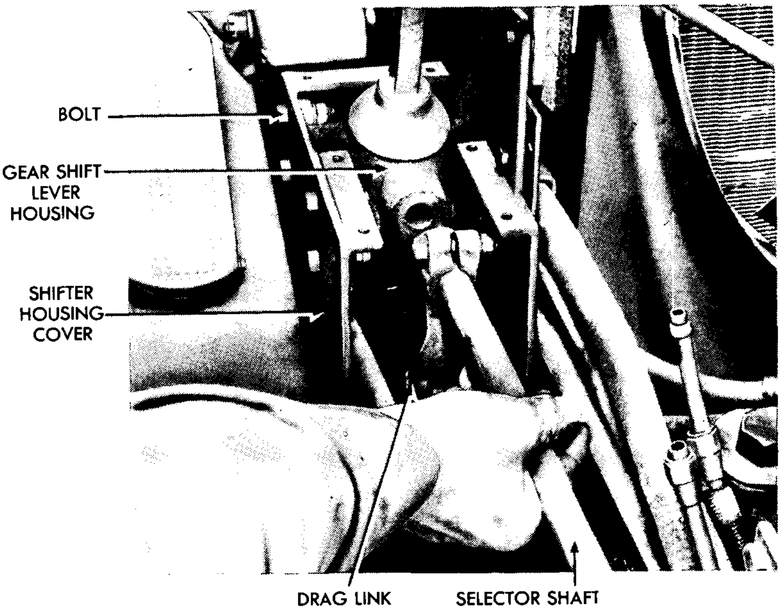


***Figure 177—Removal of Selector Shaft***

(6) Remove Selector Shaft. Remove the cotter pin and ball joint plug from the ball joint socket at the rear end of the drag link and remove the ball joint socket from the short outer shaft lever (fig. 177). Remove the ball joint spring and seat from the ball joint socket. Then remove the three cap screws and lock washers which secure the selector shaft bracket to the transmission remote control housing. At the front end of the selector shaft, pull the shaft from the gearshift lever housing.

(7) Remove Drag Link and Gearshift Lever (fig. 177). Remove the four bolts, nuts, and lock washers which hold the gearshift lever housing to the shifter housing cover. The drag link with the gearshift lever and housing attached can then be lifted from the vehicle.

(8) REMOVE REMOTE CONTROL SELECTOR SHAFT (figs. 176 and 177). Remove selector shaft bracket and felt washer from rear end of selector shaft. Then remove clamp bolt, nut, and lock washer and remove selector yoke and Woodruff key. From front end of selector shaft, remove felt washer, clamp bolt, nut, and lock washer, and remove selector yoke and Woodruff key.

(9) REMOVE GEARSHIFT LEVER FROM DRAG LINK (figs. 176 and 177). Remove cotter pin from ball joint socket and plug. Then remove ball joint plug, spring, and seat from front end of drag link. Remove drag link from lower end of gearshift lever.

(10) REMOVE BALL JOINT SOCKET (figs. 176 and 177). Remove second ball joint seat from ball joint socket at front end of drag link. Then unscrew ball joint socket from end of drag link and remove jam nut. Unscrew ball joint socket at rear end of drag link and remove jam nut.

(11) REMOVE GEARSHIFT LEVER BELL (figs. 176 and 177). Remove gearshift lever grip and tension spring by twisting it clockwise. Remove tension spring washer. Remove machine screw and lock washer which hold bell to lever, remove bell, and pull lever from bottom of housing. Remove nut and lock washer from pivot pin and remove pin.

**c. Installation.**

(1) INSTALL BELL ON GEARSHIFT LEVER. Install pivot pin in housing, securing it with a nut and lock washer, then insert gearshift lever into housing and install bell over lever and on top of housing. Secure bell to lever with a lock washer and machine screw. Install tension spring by twisting it counterclockwise, then install gearshift lever grip on end of lever.

(2) INSTALL DRAG LINK BALL JOINT PLUG (fig. 180). Screw jam nut and ball joint socket onto each end of drag link, then install ball joint seat in socket at front end of drag link. Install lower end of gearshift lever in ball joint socket with ball joint seat back of ball, on end of lever. Install second ball joint seat, ball joint spring, and ball joint plug and secure plug to socket with cotter pin.

(3) INSTALL REMOTE CONTROL SELECTOR SHAFT (fig. 176). Install key in front end of selector shaft and install selector yoke. Secure yoke to shaft by installing clamp bolt, nut, and lock washer and install new felt washer on shaft, next to yoke. At rear end of selector shaft, install selector yoke in same manner, then install felt washer on shaft next to yoke and install selector shaft bracket over end of shaft.

(4) INSTALL DRAG LINK AND GEARSHIFT LEVER (figs. 176 and 177). Install drag link, with gearshift lever and housing attached, so that gearshift housing is alined with bolt holes in shifter housing cover. Secure housing to cover with four bolts, nuts, and lock washers.

(5) INSTALL SELECTOR SHAFT. Push front end of remote control selector shaft into position in gearshift housing. Secure selector shaft bracket to remote control housing with three cap screws and lock

washers. Install one ball joint seat in ball joint socket at rear end of drag link, and position socket over end of short outer shift lever. Then install remaining ball joint seat into socket, and install ball joint spring over seat. Install ball joint plug in end of ball joint socket, and lock plug in socket with cotter pin.

(6) INSTALL DECLUTCH LEVER (fig. 174). Insert declutch lever in shifter housing cover plate and attach end of lever to clevis yoke at end of control rod by installing clevis pin and cotter pin.

(7) INSTALL TUNNEL (fig. 174). Lift shifter rod tunnel into position, sliding it under shifter housing cover plate and ahead of crew seat support at left rear of cab. Place shifter rod tunnel cover in position at rear of tunnel. Install straight pin and cotter pin which hold front axle declutch lever to shifter housing cover plate. Install four cap screws and lock washers which hold tunnel to transmission cover. Install two bolts, nuts, and lock washers which hold tunnel to seat support and tunnel cover. Install seven cap screws and lock washers and one bolt, nut, and lock washer which hold tunnel to floor.

(8) CONNECT FUEL LINES. From engine side of tunnel, connect three fuel lines to fuel tank change-over valve.

(9) INSTALL SHIFTER HOUSING COVER. Install six cap screws and lock washers which hold shifter housing cover plate to tunnel and to shifter housing cover.

(10) INSTALL CHANNEL SEAL. Install channel seal, then install four bolts, nuts, and lock washers which hold seal to tunnel, and eight cap screws and lock washers and one bolt, nut, and lock washer which hold seal to housing.

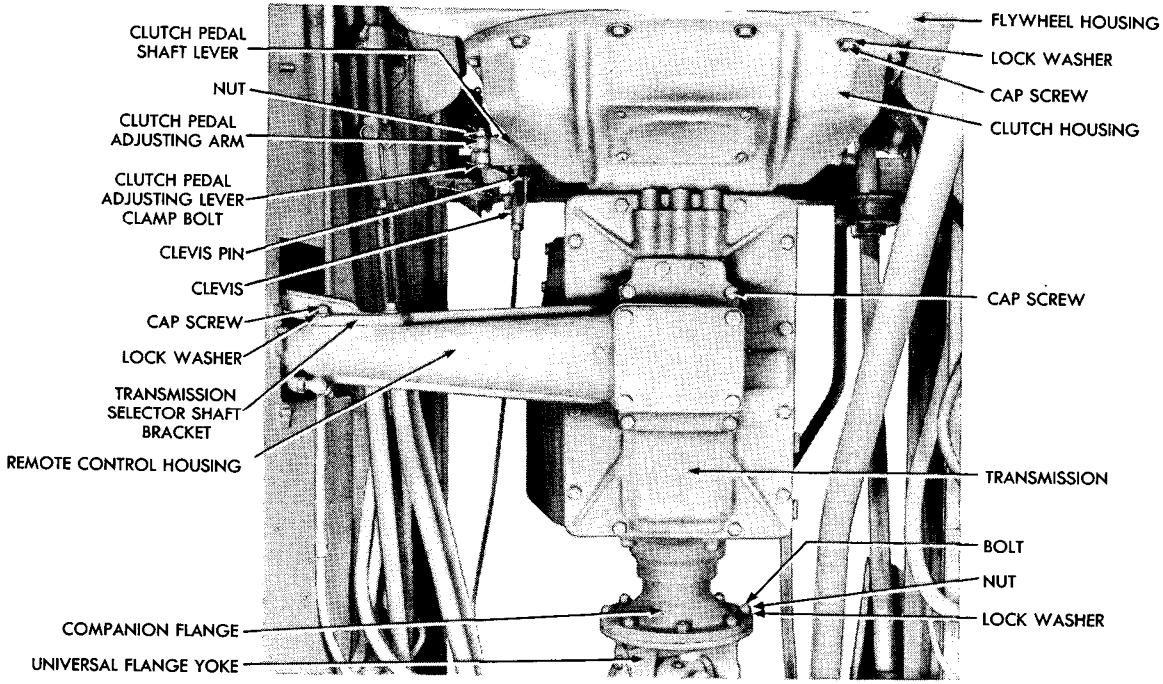
(11) INSTALL SEATS AND ENGINE SIDE COVER. Install crew seat at left rear of cab (par. 194); co-driver's seat (par. 194); water can ahead of co-driver's seat, and driver's seat (par. 194). Install engine side cover.

## 131. MAIN TRANSMISSION.

**a. Description.** The main transmission is secured to the flywheel housing at the rear of the engine by means of the clutch housing, which in turn is secured to the front end of the transmission. A propeller shaft transmits power from the main transmission to the auxiliary transmission. The main transmission has four forward and one reverse speeds, and the auxiliary transmission provides three speed ranges for each of the main transmission speeds.

**b. Removal.**

(1) REMOVE TRANSMISSION COVER (fig. 179). Remove portable tool box from top of transmission cover, then open lids of transmission cover and remove all tools and stowage. Close lids, and remove four cap screws and lock washers from rear lid, and three bolts, nuts, and lock washers from front lid. Open lids and remove three countersunk head screws from each side of transmission cover. Lift the transmission cover from vehicle.


CLUTCH PEDAL SHAFT LEVER
NUT
CLUTCH PEDAL ADJUSTING ARM
CLUTCH PEDAL ADJUSTING LEVER CLAMP BOLT
CLEVIS PIN
CLEVIS
CAP SCREW
LOCK WASHER
TRANSMISSION SELECTOR SHAFT BRACKET
REMOTE CONTROL HOUSING
COMPANION FLANGE
UNIVERSAL FLANGE YOKE
FLYWHEEL HOUSING
LOCK WASHER
CAP SCREW
CLUTCH HOUSING
CAP SCREW
TRANSMISSION
BOLT
NUT
LOCK WASHER

RA PD 76960

Figure 178—Transmission Installed

(2) REMOVE MUFFLER, EXHAUST PIPE, AND HEATER VALVE PIPE EXHAUST PIPE. Follow the procedure in paragraph 93.

(3) REMOVE TRANSFER CASE TO FRONT AXLE PROPELLER SHAFT. Remove the transfer case to front axle propeller shaft (par. 139).

(4) REMOVE SHIFTER ROD TUNNEL COVER (fig. 174). Remove crew member's seat cushion and seat back from left rear of cab. Then remove the two machine screws and the bolt, nut, and lock washer which secure the shifter rod tunnel cover in position at rear of tunnel. This provides access to the drag link.

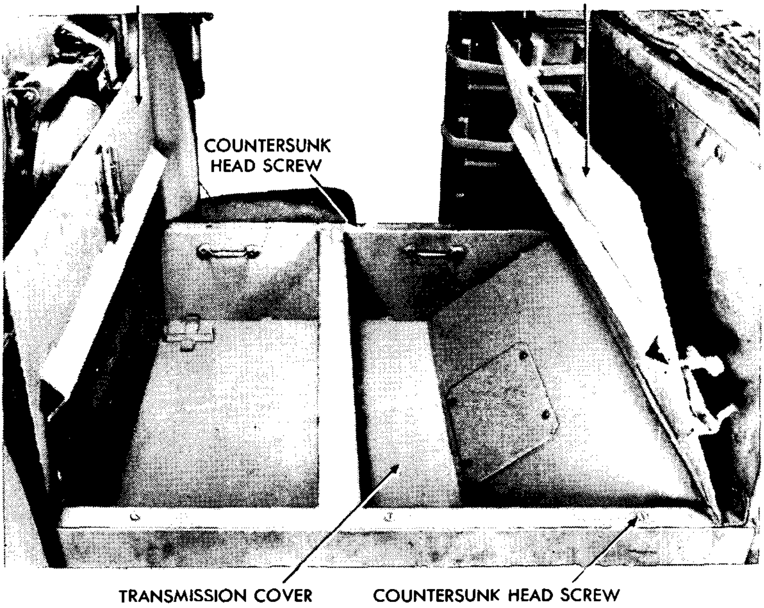


*Figure 179—Transmission Cover*

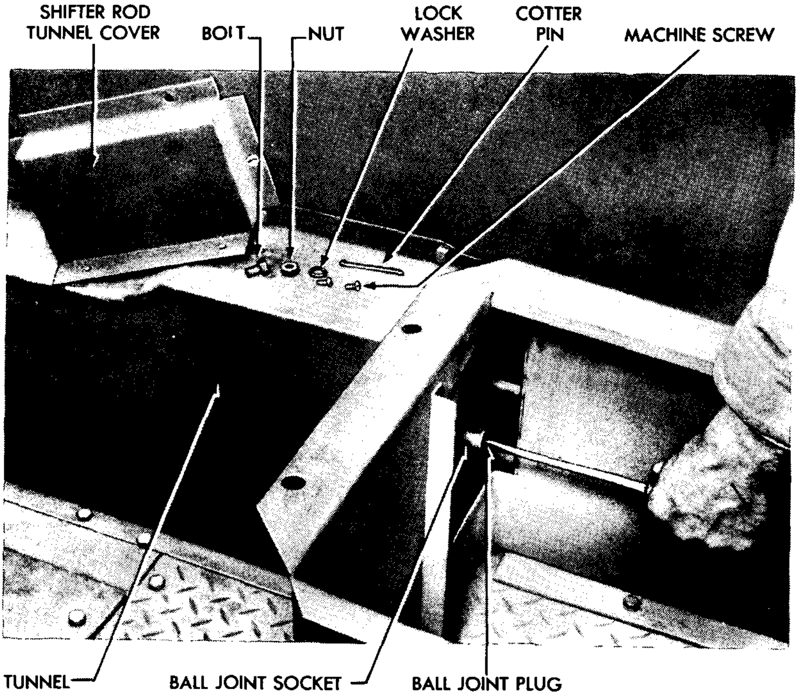
(5) DISCONNECT DRAG LINK FROM SHORT OUTSIDE SHIFT LEVER (fig. 180). Remove cotter pin from ball joint socket and remove ball joint plug, spring, and seat. The drag link can then be lowered out of the way.

(6) REMOVE SELECTOR SHAFT BRACKET (fig. 176). Remove the three cap screws and lock washers which secure the bracket to the front side of the remote control housing. Slide bracket off remote control selector shaft and remove the bracket.

(7) REMOVE REMOTE CONTROL HOUSING (fig. 176). Remove the six cap screws and lock washers which secure the housing to the transmission case and lift the housing from the transmission. Re-

move the control housing gasket. Remove the three bar position finder springs from shifting bar housing.

(8) REMOVE CLUTCH PEDAL SHAFT LEVER (fig. 176). Loosen nut on clutch pedal adjusting lever clamp bolt and pull clutch pedal adjusting arm from end of long clutch pedal shaft. Remove the cotter pin and clevis pin from the two clevises at lower end of arm and remove arm. The clutch pedal shaft lever can then be removed from the long clutch pedal shaft.



RA PD 74834

*Figure 180—Disconnecting Drag Link from Short Outside Shift Lever*

(9) DISCONNECT TRANSMISSION FROM UNIVERSAL JOINT (fig. 176). Remove the eight bolts, nuts, and lock washers which hold the companion flange to the universal flange yoke.

(10) DISCONNECT CLUTCH HOUSING FROM FLYWHEEL HOUSING (fig. 176). Remove the 12 cap screws and lock washers which secure the clutch housing to the flywheel housing.

(11) REMOVE TRANSMISSION FROM VEHICLE (fig. 181). Place a chain sling around transmission case and attach sling to a hoist suspended through gun mount. Pull the assembly back, free of the clutch housing, and lower it to a suitable dolly beneath the vehicle. When lowering the transmission, guide it carefully between the two

fuel tank support angles. By means of the dolly, slide transmission from beneath the vehicle.

**c. Installation.**

(1) INSTALL TRANSMISSION (fig. 181). Slide the transmission under the vehicle so it is in line with its installed position. Attach a chain sling around the transmission case, and by means of a hoist suspended through the gun mount, pull the transmission upward, guiding it carefully between the two fuel tank support angles. Move transmission forward, guiding main shaft into clutch pilot bearing until housing is fitted directly against the flywheel housing, with cap screw holes of the flywheel housing, and the clutch housing, in alinement. Secure clutch housing to flywheel housing with 12 cap screws and lock washers.

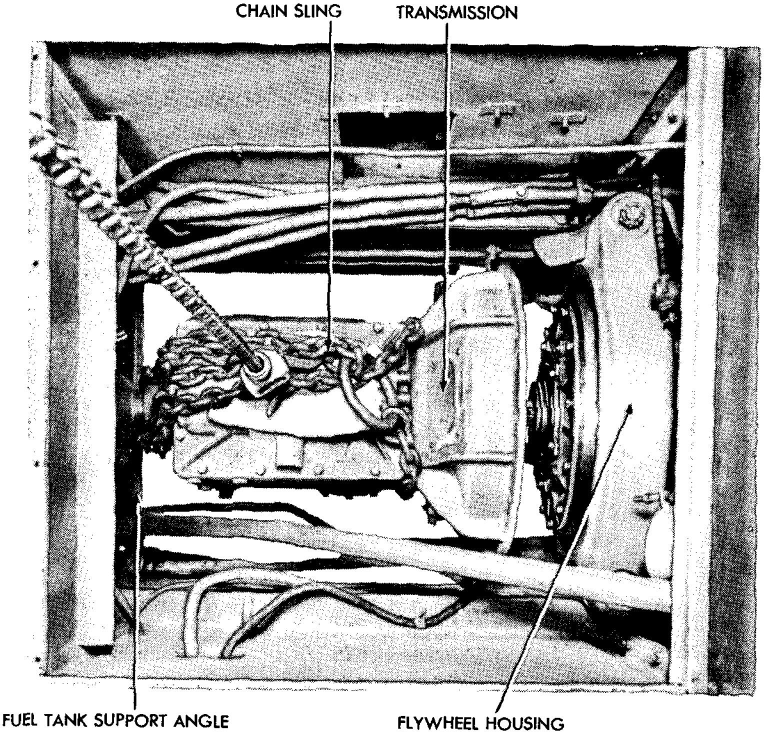


*Figure 181—Removal of Transmission*

(2) CONNECT TRANSMISSION TO UNIVERSAL JOINT (fig. 181). Install the eight bolts, nuts, and lock washers which hold the companion flange at the transmission to the universal flange yoke.

(3) INSTALL CLUTCH PEDAL SHAFT LEVER (fig. 181). Install the clutch pedal shaft lever on the long clutch pedal shaft. Then install the clutch pedal adjusting arm on the end of the long clutch pedal shaft, and secure the lower end of the arm to the two yokes at the ends of the two clutch shafts by installing clevis pin and securing it with a cotter pin. Tighten nut on clutch pedal adjusting lever clamp bolt.

(4) INSTALL REMOTE CONTROL HOUSING ON TRANSMISSION (fig. 181). Cement a new control housing gasket to the transmission case. Place remote control housing in position on transmission, making sure that transmission is in neutral, and that inner shifting lever is entered into slots of yoke bars. Secure the housing to the transmission case with six cap screws and lock washers.

(5) INSTALL SELECTOR SHAFT BRACKET (fig. 181). Slide the selector shaft bracket on the remote control selector shaft, and position bracket on front of remote control housing. Secure bracket to housing with three cap screws and lock washers.

(6) CONNECT DRAG LINK TO SHORT OUTSIDE SHIFT LEVER (fig. 180). Lift the drag link into position, with the ball joint socket at its rear end entered over end of short shift lever. Install ball joint seat, ball joint spring, and ball joint plug in end of ball joint socket.

(7) INSTALL SHIFTER ROD TUNNEL COVER (fig. 174). Place the shifter rod tunnel cover in position at the end of shifter rod tunnel, and secure it with two machine screws and a bolt, nut, and lock washer. Install cushion and seat back of crew member's seat at left rear of cab.

(8) INSTALL TRANSFER CASE TO FRONT AXLE PROPELLER SHAFT. Install transfer case to front axle propeller shaft (par. 140).

(9) INSTALL MUFFLER, EXHAUST PIPE, AND HEATER VALVE EXHAUST PIPE. Follow the procedure in paragraph 93.

(10) INSTALL TRANSMISSION COVER. Lift the transmission cover into position over transmission. Open lids of cover and install three countersunk-head machine screws at each side of cover. Then close lids and install four cap screws and lock washers in rear lid and three bolts, nuts, and lock washers in front lid. Open lids and install stowage.

## 132. AUXILIARY TRANSMISSION CONTROLS AND LINKAGE.

**a. Description.** The auxiliary transmission is mounted in the frame at the rear of the main transmission, below the tandem winches. A propeller shaft and universal joint assembly transmits power from the main transmission to the auxiliary transmission. The auxiliary transmission transmits power to the rear differential and carrier assembly to propel the rear wheels. It also transmits power to the transfer case which is mounted on the rear of the auxiliary transmission. The transfer case transmits power to the declutch assembly, and the declutch assembly transmits power to the front

## MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

differential and carrier assembly to drive the front axle. The auxiliary transmission also transmits power to the two power take-off assemblies which are mounted at the top and side of the auxiliary transmission.

**b. Removal.**

(1) REMOVE TRANSMISSION COVER (fig. 179). Remove portable tool box from top of transmission cover assembly. Open lids of transmission cover and remove all tools and stowage. Then close lids and remove four cap screws and lock washers from rear lid, and three bolts, nuts, and lock washers from front lid. Next open lids and remove three countersunk-head machine screws from each side of transmission cover. Lift transmission cover from vehicle.

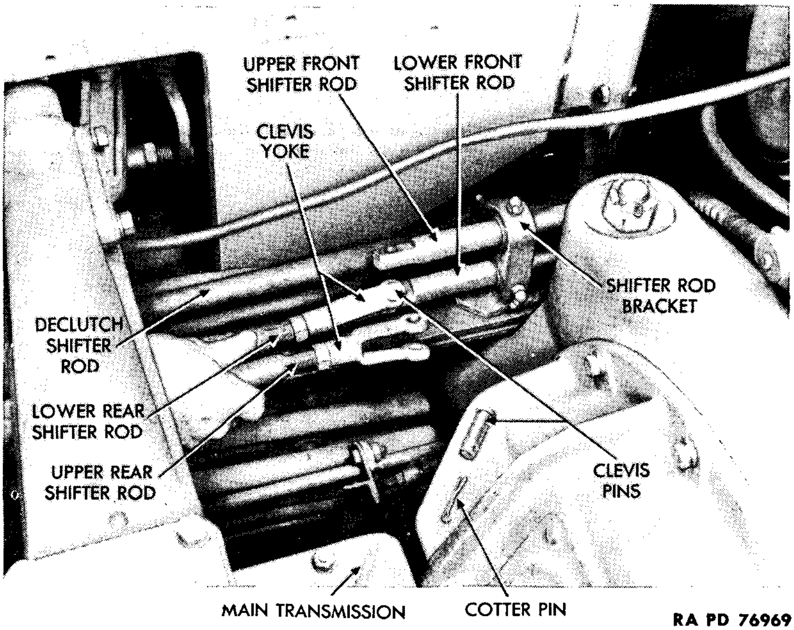

UPPER FRONT SHIFTER ROD
LOWER FRONT SHIFTER ROD
CLEVIS YOKE
SHIFTER ROD BRACKET
DECLUTCH SHIFTER ROD
LOWER REAR SHIFTER ROD
UPPER REAR SHIFTER ROD
CLEVIS PINS
MAIN TRANSMISSION
COTTER PIN
RA PD 76969

*Figure 182—Removal of Auxiliary Transmission Shifter Rod*

(2) REMOVE REAR SHIFTER RODS (fig. 182). At the front end of top mounting to auxiliary transmission power take-off assembly, disconnect upper and lower gear shifter rods by removing two cotter pins and clevis pins which hold upper rod to first speed shift rod and lower rod to second and third speed shifting rod. Then, in space underneath transmission cover assembly, remove two cotter pins and clevis pins, which secure upper rear shifter rod clevis yoke to upper front shifter rod, and lower rear shifter rod clevis yoke to lower front shifter rod. Remove upper and lower rods.

(3) REMOVE FRONT SHIFTER RODS (fig. 182). After removing rear rods, remove two bolts, nuts, and lock washers which secure shifter rod bracket to frame. Slide bracket back on rear declutch shifter rod and pull it off auxiliary transmission upper and lower front shifter rods. Then, from underneath left front end of vehicle, remove two cotter pins and clevis pins which secure the two shifter rods to auxiliary transmission shifting arms below shifting lever. Remove the two shifter rods.

(4) REMOVE SHIFTING LEVER (fig. 183). From underneath front end of vehicle, remove four bolts, nuts, and lock washers which secure shifting lever bracket to front bulkhead; two of bolt heads must be held from turning from inside cab. Lift out shifting lever, arms, and bracket.

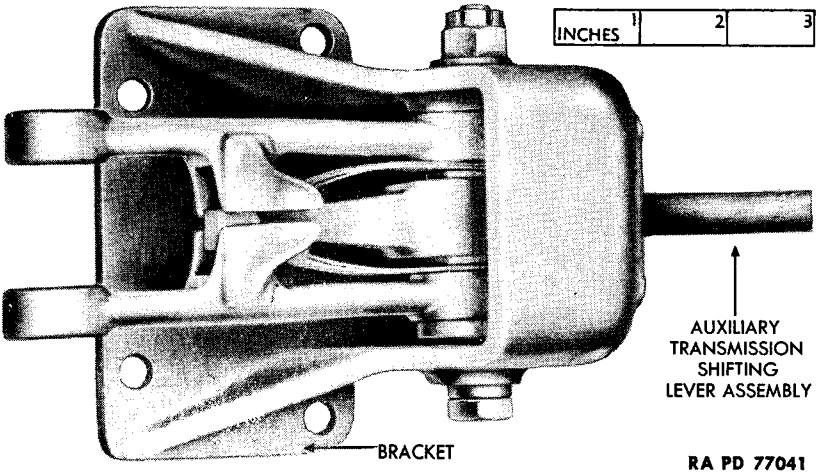


*Figure 183—Auxiliary Transmission Shifting Lever Assembly*

c. **Installation.**

(1) INSTALL AUXILIARY TRANSMISSION SHIFTING LEVER (fig. 183). Place shifting lever, arms, and bracket assembly into position from inside cab and install four bolts, nuts, and lock washers which secure bracket to front bulkhead. NOTE: *Except for two bolt heads, which must be held from turning from inside cab, access to bolts and nuts is from underneath left front end of vehicle.*

(2) INSTALL FRONT SHIFTER RODS (fig. 182). Place auxiliary transmission upper and lower front shifter rods in position and secure them to first, second, and third speed shifting arms with two clevis pins and cotter pins, working from underneath left front end of vehicle. Then, at rear of rods, slide shifter rod bracket, which is loose on declutch shifter rod, forward and insert rear ends of two auxiliary transmission front shifter rods into bracket. Secure bracket to frame with two bolts, nuts, and lock washers.

(3) INSTALL REAR SHIFTER RODS (fig. 182). Secure upper and lower rear shifting rods to front rods, attaching clevis yoke at front end of each rear rod to corresponding front rod with a clevis pin and cotter pin. At front end of top mounting to auxiliary transmission power take-off, connect upper and lower shifter rods to first speed shifting rod (upper) and to second and third speed shifting rod (lower), by installing two clevis pins and cotter pins.

(4) INSTALL TRANSMISSION COVER (fig. 179). Lift transmission cover assembly into position in cab. Open lids and install three countersunk-head screws in each side of cover. Next close lids and install four cap screws and lock washers in rear lid and three bolts, nuts, and lock washers in front lid. Open lids and install all tools and stowage, then install portable tool box on top of transmission cover.

## 133. AUXILIARY TRANSMISSION.

**a. Description.** The auxiliary transmission is mounted in the frame at the rear of the main transmission and below the tandem winch assembly, and is supported on frame cross members by two transfer case hanger studs, at the rear, and by the auxiliary transmission trunnion, in front. Power is transmitted to the auxiliary transmission from the main transmission by means of a propeller shaft. The auxiliary transmission transmits power to the rear differential and carrier assembly to propel the rear wheels, and also transmits power to the transfer case, which is mounted on the rear of the auxiliary transmission. The transfer case transmits power to the declutch assembly which is connected to the front axle assembly by a propeller shaft, thus making front wheel drive available when desired. The auxiliary transmission also transmits power to the two power take-off assemblies which are mounted at the top and side of the auxiliary transmission. The top power take-off drives the tandem rear mounted winches and the side power take-off drives the front mounted winch.

**b. Removal.**

(1) DISCONNECT AUXILIARY TRANSMISSION TO REAR DIFFERENTIAL AND CARRIER PROPELLER SHAFT. Remove eight bolts, nuts, and lock washers which hold companion flange to universal joint yoke at rear of auxiliary transmission, and lower propeller shaft and universal joint out of the way.

(2) DISCONNECT DECLUTCH TO FRONT DIFFERENTIAL PROPELLER SHAFT (fig. 178). Pry back two bearing cap lock straps from cap screws which hold two bearing caps to universal sleeve yoke (rear). Then remove two cap screws and two straps and bearing caps. Pry rear yoke so one universal joint bearing can be removed from yoke and journal, and then pry rear yoke in opposite direction to remove second bearing. Lower slip joint yoke and propeller shaft out of the way, and leave universal sleeve yoke attached to declutch assembly.

(3) DISCONNECT MAIN TRANSMISSION TO AUXILIARY TRANSMISSION PROPELLER SHAFT (fig. 178). Remove eight bolts, nuts, and lock washers which secure companion flange to front yoke. Then remove dust cap from forward yoke, and remove yoke from companion flange and propeller shaft.

(4) DISCONNECT SHIFTING ROD FROM POWER TAKE-OFF SHIFT ROD. Remove cotter pin and clevis pin which hold shifting rod to power take-off shift rod.

(5) DISCONNECT FRONT MOUNTED WINCH DRIVE SHAFT (fig. 178). NOTE: *The front mounted winch drive shaft is supported by means of two front mounted winch housing single bearings, which are attached to two fuel tank support angles.* In order to move drive shaft forward, first disconnect the two bearings from fuel tank support angles. Remove three bolts, nuts, and lock washers, which hold one bearing assembly and shield to rear support angle, and two nuts, bolts, and lock washers, which hold second bearing assembly to front support angle. Remove set screw from rear yoke at rear end of drive shaft and pull drive shaft forward, so rear yoke will be pulled free of side mounting power take-off intermediate gear shaft.

(6) DISCONNECT AUXILIARY TRANSMISSION GUARD (fig. 178). Disconnect guard from frame cross member by removing one bolt, nut, and lock washer and loosening the other bolt. Pull guard to one side, free of auxiliary transmission.

(7) DISCONNECT SHIFT ROD FROM TOP MOUNTING POWER TAKE-OFF GEARSHIFT ROD. Remove cotter pin and clevis pin, which secure power take-off gearshift rod to links of gearshift linkage, and lower shift rod out of the way.

(8) DISCONNECT TANDEM WINCH UNIVERSAL JOINT ASSEMBLY. Loosen set screw from rear yoke at side mounting to auxiliary transmission power take-off assembly. NOTE: *When the auxiliary transmission is ready to be lowered from vehicle, universal joint assembly will pull out from power take-off assembly.*

(9) DISCONNECT LOWER AND UPPER REAR SHIFTER RODS. Disconnect lower rear shifter rod at auxiliary transmission by removing cotter pin and clevis pin from yoke at rear end of rod. Disconnect upper rear shifter rod in the same manner.

(10) ATTACH CHAIN AND HOIST TO AUXILIARY TRANSMISSION (fig. 184). Place a chain sling sidewise around auxiliary transmission, first dropping chain back of rear tandem winch drum, around declutch assembly, and upward next to transfer case at rear of side power take-off assembly. Attach hoist to sling so that lift will be at rear of winch drum.

(11) DISCONNECT AUXILIARY TRANSMISSION FROM FRAME AT FRONT END (fig. 184). Remove two bolts, nuts, and lock washers which hold trunnion at front end of auxiliary transmission to frame cross member.

(12) DISCONNECT REAR END OF AUXILIARY TRANSMISSION FROM FRAME. Remove cotter pin from top nut of each transfer case hanger

stud. Because of the difficulty of gaining access to the two transfer case hanger studs, which support the transfer case end of the auxiliary transmission to the frame, the procedure for removal of top nuts is unusual. The top nut on each hanger stud cannot be turned, but can be kept from turning with an open-end wrench. Therefore loosen lower lock nut and move adjusting nut beneath it upward, locking the two nuts together and leaving the stud free to turn in hole in transfer case. Then use a wrench on both nuts at the same time and turn stud while top nut is kept from turning by means of an open-end wrench. NOTE: *Readjust position of nuts on stud as required to unscrew stud from top nut. Repeat procedure to remove remaining transfer case hanger stud.*

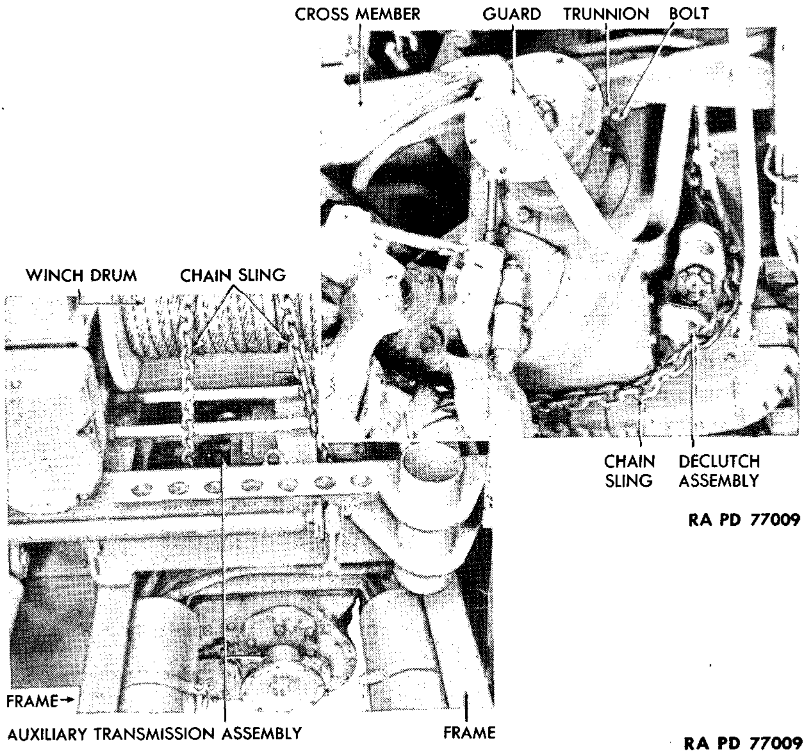

CROSS MEMBER
GUARD
TRUNNION
BOLT
WINCH DRUM
CHAIN SLING
CHAIN SLING
DECLUTCH ASSEMBLY
RA PD 77009
FRAME
AUXILIARY TRANSMISSION ASSEMBLY
FRAME
RA PD 77009

***Figure 184—Removing Auxiliary Transmission***

(13) Remove Auxiliary Transmission (fig. 184). Lower transmission slowly. The position of sling and hoist, back of rear tandem winch drum, will tend to pull assembly toward rear of the vehicle, which will enable tandem winch universal joint to pull free of top power take-off. Continue to lower auxiliary transmission, guiding

it carefully so it will clear all parts of frame and chassis. Place it on a dolly, and remove it from underneath the vehicle.

(14) REMOVE TOP MOUNTED POWER TAKE-OFF. Remove eight cap screws and lock washers which secure cover to top mounted power take-off case and remove cover and gasket. Remove eight cap screws and lock washers which secure power take-off to auxiliary transmission case and lift off power take-off and shifter housing gasket. NOTE: *The two cap screws, which secure power take-off to transmission, are inside the case.*

(15) REMOVE SIDE MOUNTED POWER TAKE-OFF. Proceed as outlined in subparagraph 136 **b** (2).

(16) REMOVE TRANSFER CASE AND DECLUTCH UNIT. Proceed as outlined in subparagraph 137 **b** (2) through (6). NOTE: *Do not remove speedometer adapter and driven gear from main shaft rear bearing cap.*

c. **Installation.**

(1) INSTALL TRANSFER CASE AND DECLUTCH UNIT ON AUXILIARY TRANSMISSION. Proceed as outlined in subparagraph 137 **c** (2) through (8).

(2) INSTALL SIDE MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Refer to subparagraph 137 **c** (1).

(3) INSTALL TOP MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Place a new shifter housing gasket on auxiliary transmission case and lift power take-off into position on case. Secure power take-off to auxiliary transmission case with eight cap screws and lock washers; two of the cap screws being inside the case. Install a new gasket on top of power take-off case and secure cover to case with eight cap screws and lock washers.

(4) ATTACH HOIST TO AUXILIARY TRANSMISSION AND LIFT IT INTO POSITION (fig. 184). Slide auxiliary transmission into position underneath frame and then place a chain sling around assembly, positioning chain sidewise around declutch assembly and in back of side mounted power take-off. Lower a hoist back of the rear tandem winch drum and attach hoist to chain sling. Lift assembly slowly upward; and as it is partly raised, install one end of tandem winch universal joint and install other end in top mounted power take-off assembly as it is being raised. Guide assembly carefully into position, making sure that it clears all frame and chassis parts. As it is raised into position be sure that trunnion is positioned correctly for bolts to be installed and push auxiliary transmission forward as required.

(5) SECURE REAR END OF AUXILIARY TRANSMISSION TO FRAME. With hanger studs through frame cross member, screw each stud into nut. Hold nut from turning with an open-end wrench and use a wrench on lower adjusting and lock nuts to turn stud into nut. When top nut is tight, tighten lower adjusting nut at each stud and lock it with lock nut. Lock top castellated nut with a cotter pin.

(6) SECURE FRONT END OF AUXILIARY TRANSMISSION TO FRAME (fig. 184). Secure trunnion to frame cross member by installing two bolts, nuts and lock washers.

(7) CONNECT UPPER AND LOWER REAR SHIFTER ROD. Install cotter pin and clevis pin which secure yoke at rear end of lower rear shifter rod to auxiliary transmission. Repeat procedure on lower rear shifter rod.

(8) CONNECT TANDEM WINCH UNIVERSAL JOINT. Use a socket head set screw wrench to tighten the set screw which secures the rear yoke of the universal joint assembly to the power take-off assembly.

(9) CONNECT SHIFT ROD TO TOP MOUNTING POWER TAKE-OFF GEARSHIFT ROD. Install clevis pin and cotter pin which secure lever at end of shift rod to power take-off gearshift rod.

(10) INSTALL AUXILIARY TRANSMISSION GUARD. Lift guard into position around front end of auxiliary transmission and secure it to frame cross member by installing two bolts, nuts, and lock washers.

(11) CONNECT FRONT MOUNTED WINCH DRIVE SHAFT. Slide drive shaft back until its rear yoke is in position on intermediate gear shaft of side mounted to auxiliary transmission power take-off. Install socket head set screw which secures yoke to intermediate gear shaft. Then install three bolts, nuts, and lock washers, which secure front mounted winch housing single bearing and shield to rear fuel tank support angle. Next install two bolts, nuts, and lock washers which hold second bearing to front fuel tank support angle.

(12) CONNECT SHIFTING ROD TO POWER TAKE-OFF SHIFT ROD (fig. 185). Lift shifting rod in position on power take-off shift rod and secure two rods together by installing clevis and cotter pins.

(13) CONNECT MAIN TRANSMISSION TO AUXILIARY TRANSMISSION PROPELLER SHAFT. Install slip joint yoke on propeller shaft and aline yoke with companion flange front of auxiliary transmission. Secure yoke to companion flange with eight bolts, nuts and lock washers. Screw dust cap securely upon slip joint yoke of propeller shaft and universal joint.

(14) CONNECT DECLUTCH ASSEMBLY TO FRONT DIFFERENTIAL PROPELLER SHAFT. Install journal of universal into sleeve yoke which is attached to forward end of declutch assembly. Tap two bearing assemblies into position over ends of journal and into sleeve yoke, and install bearing cap and bearing cap lock strap over each bearing, securing with two cap screws and lock washers. Bend lock strap around cap screws.

(15) CONNECT AUXILIARY TRANSMISSION TO REAR DIFFERENTIAL PROPELLER SHAFT. Lift propeller shaft and universal joint into alinement with companion flange at rear of auxiliary transmission and secure yoke to companion flange by installing eight bolts, nuts, and lock washers.

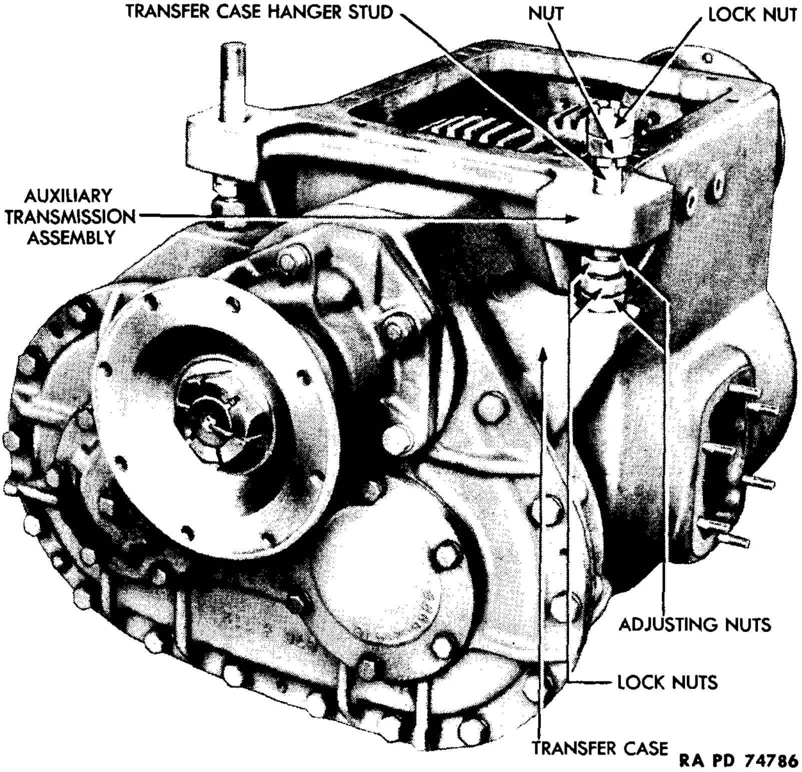

TRANSFER CASE HANGER STUD
NUT
LOCK NUT
AUXILIARY TRANSMISSION ASSEMBLY
ADJUSTING NUTS
LOCK NUTS
TRANSFER CASE
RA PD 74786

*Figure 185—Transfer Case and Auxiliary Transmission Removed*

## 134. TRANSFER CASE.

**a. Description.** The transfer case is secured to the rear of the auxiliary transmission. The transfer case gears are driven by the auxiliary main shaft gear. The declutch unit for driving the front axle differential is attached to the left front of the transfer case.

**b. Removal.**

(1) PRELIMINARY INSTRUCTIONS. Remove auxiliary transmission (par. 133). Remove side mounted power take-off (par. 136).

(2) REMOVE HANGER STUDS (fig. 185). Remove cotter pin lower castellated nut from each stud and lock it with a similar nut on top of stud. Loosen lock nuts between transfer case and auxiliary transmission case, then use two wrenches to keep the four nuts from turning and at same time use a third wrench to turn lower top nut and remove stud.

(3) REMOVE UNIVERSAL COMPANION FLANGE (fig. 181). Remove lock washer and castellated nut from end of transfer case main shaft. Pull off companion flange and remove key.

## MAIN AND AUXILIARY TRANSMISSIONS, TRANSFER CASE, POWER TAKE-OFFS, AND DECLUTCH UNIT

(4) REMOVE SPEEDOMETER DRIVEN AND DRIVE GEARS (figs. 186 and 187). Unscrew knurled nut which holds speedometer adapter to speedometer drive outlet cover and remove adapter. Then remove two cap screws which hold speedometer drive outlet cover to main shaft rear bearing cap. Remove outlet cover and outlet cover gasket. Remove three cap screws and lock washers and three nuts and lock washers which secure main shaft rear bearing cap to transfer case and remove bearing cap and gasket. Remove speedometer driven gear and key, then bend up lugs on main shaft rear bearing nut and lock washers. Remove main shaft rear protector washer and main shaft rear bearing retainer and gasket.

(5) REMOVE TRANSFER CASE COVER (fig. 188). Remove 16 cap screws and lock washers which secure transfer case cover to case. Install and tighten three puller screws to remove cover, with idler shaft, idler shaft gear, ball idler shaft bearing, and rear bearing driven shaft cup attached. Remove transfer case cover gasket.

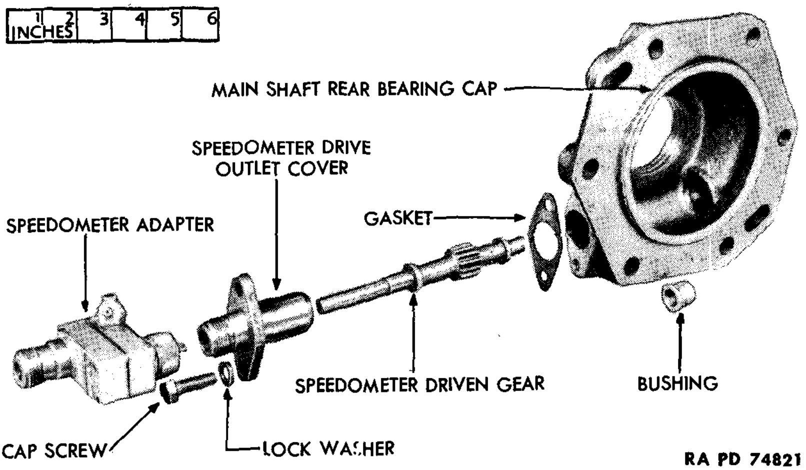


*Figure 186—Components of Speedometer Drive Assembly*

(6) REMOVE TRANSFER CASE (fig. 185). Remove main drive gear and spacer from auxiliary transmission main shaft. Remove five cap screws and lock washers which secure transfer case to auxiliary transmission case and remove transfer case and transfer case gasket.

(7) REMOVE DECLUTCH ASSEMBLY FROM TRANSFER CASE (fig. 189). Lift driven shaft gear, declutch shaft, and attached parts from transfer case. Then remove six nuts and lock washers, which secure declutch shaft bearing carrier to cover, and remove carrier and gasket.

**c. Installation.**

(1) INSTALL DECLUTCH ASSEMBLY. Drive bearing cup into transfer case declutch shaft opening. Cement new declutch shaft bearing

carrier gasket to transfer case. Then place declutch assembly on case and secure with six nuts and lock washers.

(2) INSTALL TRANSFER CASE (fig. 185). Cement new auxiliary transmission and transfer case gasket to auxiliary transmission case, making sure that all traces of the old gasket have been removed. Install main drive gear spacer and gear on main shaft. Install transfer case with declutch assembly over long and short transfer case transmission studs on auxiliary transmission case. Install nuts on three short studs and install two cap screws and lock washers which secure transfer case to auxiliary transmission case. Lock cap screws and stud nuts with wire.

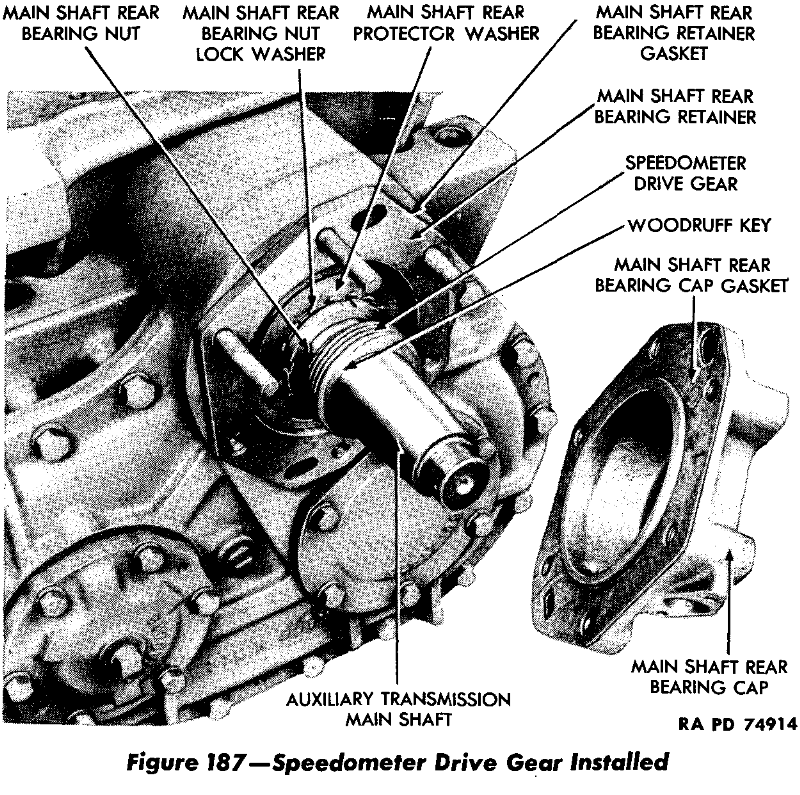

MAIN SHAFT REAR BEARING NUT
MAIN SHAFT REAR BEARING NUT LOCK WASHER
MAIN SHAFT REAR PROTECTOR WASHER
MAIN SHAFT REAR BEARING RETAINER GASKET
MAIN SHAFT REAR BEARING RETAINER
SPEEDOMETER DRIVE GEAR
WOODRUFF KEY
MAIN SHAFT REAR BEARING CAP GASKET
AUXILIARY TRANSMISSION MAIN SHAFT
MAIN SHAFT REAR BEARING CAP
RA PD 74914

*Figure 187—Speedometer Drive Gear Installed*

(3) INSTALL TRANSFER CASE COVER (fig. 188). Cement new transfer case cover gasket to mounting surface of transfer case. Be sure that all traces of old gasket have been removed. Lift transfer case cover into position on transfer case, with idler shaft gear meshing with driven shaft gear, and with cover dowel in dowel holes of transfer case. Secure cover to case with 16 cap screws and lock washers.

(4) INSTALL AUXILIARY TRANSMISSION MAIN SHAFT REAR BEARING. Drive main shaft rear bearing into main shaft rear bearing retainer. Install main shaft rear bearing retainer gasket, cementing it to transfer case cover. Slide retainer and main shaft rear bearing into opening in transfer case cover.

(5) INSTALL SPEEDOMETER DRIVE GEAR (fig. 187). Place main shaft rear protector washer and main shaft rear adjusting nut lock washer on auxiliary transmission main shaft. Install main shaft rear bearing nut, tighten, and lock with lugs of lock washers. Insert key in slot of main shaft and slide speedometer drive gear into position with hub side inward. Drive speedometer gear bushing into main shaft rear bearing cap, then cement a new main shaft rear bearing cap gasket to main shaft rear bearing cap, and install cap over main shaft and studs on transfer case cover. Secure cap with three cap screws and nuts, and three cap screws and stud nuts.

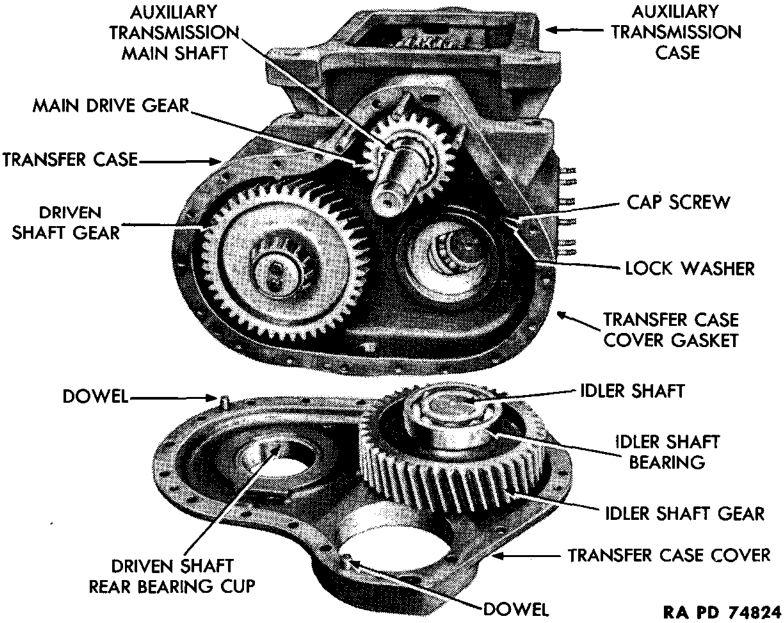

AUXILIARY TRANSMISSION MAIN SHAFT
AUXILIARY TRANSMISSION CASE
MAIN DRIVE GEAR
TRANSFER CASE
DRIVEN SHAFT GEAR
CAP SCREW
LOCK WASHER
TRANSFER CASE COVER GASKET
DOWEL
IDLER SHAFT
IDLER SHAFT BEARING
IDLER SHAFT GEAR
TRANSFER CASE COVER
DRIVEN SHAFT REAR BEARING CUP
DOWEL
RA PD 74824

***Figure 188—Cover Removed from Transfer Case***

(6) INSTALL SPEEDOMETER DRIVEN GEAR AND ADAPTER (figs. 186 and 187). Cement new speedometer drive outlet cover gasket to rear bearing cap. Install speedometer driven gear and speedometer outlet cover into rear bearing cap and secure cover to cap with two cap screws and lock washers. Install speedometer adapter to outlet cover and tighten knurled nut.

(7) INSTALL UNIVERSAL COMPANION FLANGE. Install key on main shaft and slide companion flange onto main shaft. Secure flange with castellated nut and cotter pin.

(8) INSTALL HANGER STUDS (fig. 185). Install two transfer case hanger studs which secure transfer case to auxiliary transmission case and also support assembly to frame cross member of vehicle. Insert each stud through holes in auxiliary transmission case and in turn screw on four nuts (two lock nuts and two adjusting nuts) and then position them between transfer case and auxiliary transmission case as follows: Screw four nuts onto each stud until stud can enter through stud hole in transfer case and castellated nut and cotter pin can be installed at lower end of stud. (Stud threads should extend through castellated nut at least one and one-half threads.) Tighten two adjusting nuts and lock in position with two lock nuts. Install top castellated nut and cotter pin.

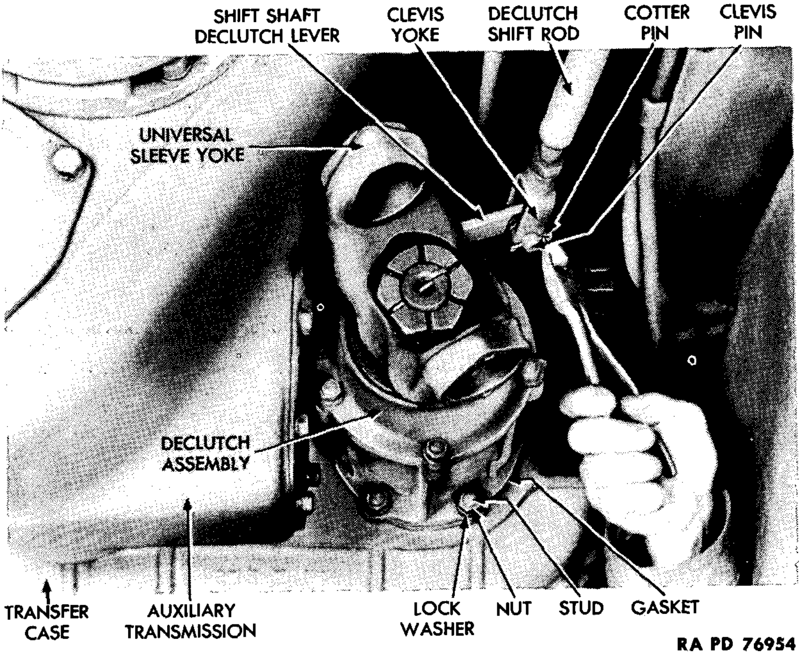

SHIFT SHAFT DECLUTCH LEVER
CLEVIS YOKE
DECLUTCH SHIFT ROD
COTTER PIN
CLEVIS PIN
UNIVERSAL SLEEVE YOKE
DECLUTCH ASSEMBLY
TRANSFER CASE
AUXILIARY TRANSMISSION
LOCK WASHER
NUT
STUD
GASKET
RA PD 76954

*Figure 189—Removal of Declutch Assembly*

(9) INSTALL SIDE MOUNTED POWER TAKE-OFF ON AUXILIARY TRANSMISSION. Refer to paragraph 136.

(10) INSTALL AUXILIARY TRANSMISSION IN VEHICLE. Refer to paragraph 133.

## 135. DECLUTCH ASSEMBLY, CONTROLS AND LINKAGE.

**a. Description.** The front axle declutch assembly is secured to the left-hand front side of the transfer case at the rear of the auxiliary transmission. It has a jaw clutch which can be engaged or disengaged by the driver in order to obtain front wheel drive when desired. A propeller shaft connected to the front end of the declutch assembly transmits power to the front differential and carrier assembly.

**b. Removal of Declutch Assembly** (fig. 189). Disconnect the universal joint from declutch assembly (par. 139), leaving cotter pin, declutch shaft nut, and universal sleeve yoke on declutch assembly. Then disconnect declutch shift rod clevis yoke by removing cotter and clevis pins which secure yoke to shift shaft declutch lever and move yoke out of the way. Remove six nuts and lock washers which secure declutch assembly to transfer case studs and remove declutch assembly and declutch shaft bearing carrier to case gasket.

**c. Installation of Declutch Assembly.** Cement new declutch shaft bearing carrier to case gasket in position over transfer case studs. Place declutch assembly in neutral position, lift declutch assembly onto transfer case studs, and install six nuts and lock washers. Place declutch shift rod clevis yoke in position on shift shaft declutch lever and secure with clevis and cotter pins. Connect propeller shaft and universal joint to the universal sleeve yoke at front end of declutch assembly (par. 139).

**d. Removal of Declutch Controls and Linkage.**

(1) REMOVE REAR DECLUTCH SHIFTER ROD (fig. 189). Remove cotter pin and clevis pin which hold clevis yoke at rear end of rear declutch shifter rod to shift shaft declutch lever. Then remove cotter pin and clevis pin which hold clevis yoke at front end of rear declutch shifter rod to front declutch shifter rod and remove rear rod.

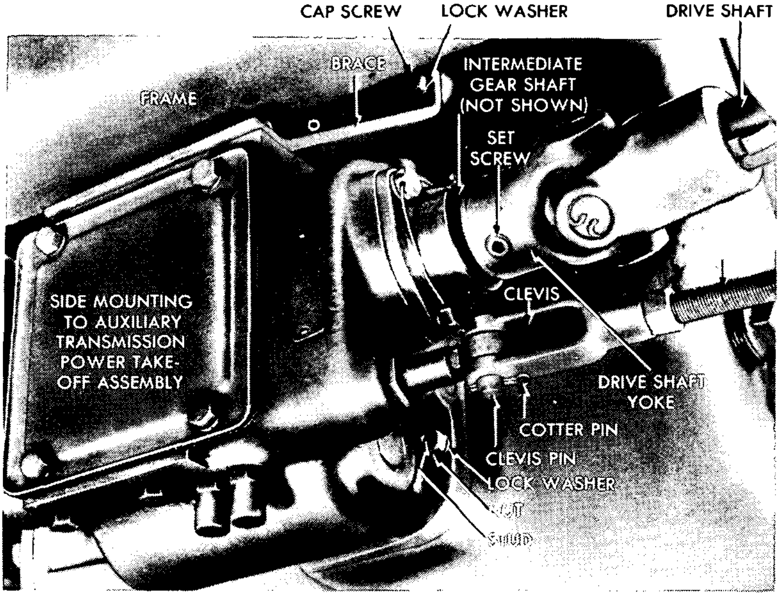
(2) REMOVE FRONT DECLUTCH SHIFTER ROD AND SHIFT ROD LEVER (fig. 189). Remove shifter rod tunnel as instructed in paragraph 130 **b** (3). NOTE: *This includes the removal of the declutch shift rod lever attached to the shifter housing cover plate.* Remove cotter pin and pin which secures lever to plate. Then disconnect two auxiliary transmission rear shifter rods from auxiliary transmission front shifter rods by removing two cotter and clevis pins which hold rods together. Remove two bolts, nuts, and lock washers, which secure front shifter rod bracket to frame, and slide bracket back on front declutch shifter rod until it is free of auxiliary transmission shifter rods. Remove front declutch shifter rod with front bracket attached by pulling rear end of rod through rear bracket below fuel tank rear support angle.

**e. Installation of Declutch Controls and Linkage.**

(1) INSTALL FRONT DECLUTCH SHIFTER ROD AND SHIFT ROD LEVER (fig. 189). Lift front declutch shifter rod with front shifter rod bracket attached into position, sliding rear end of rod through rear

shifter rod bracket below rear fuel tank support angle. Slide bracket forward and over auxiliary transmission front shifter rods and install two bolts, nuts, and lock washers which secure bracket to frame. Connect two auxiliary transmission rear shifter rods to auxiliary transmission front shifter rods by installing two clevis and cotter pins. Install declutch shift rod lever to shifting housing cover plate, securing lever to plate with pin and cotter pin. Install shifter rod tunnel as instructed in paragraph 130.

(2) Install Rear Declutch Shifter Rod (fig. 189). Install rear end of rear declutch shifter rod to shift shaft declutch lever by installing clevis and cotter pins through clevis yoke and lever. Then install clevis and cotter pins which hold clevis yoke at front end of rear declutch shifter rod to front declutch shifter rod.


CAP SCREW
LOCK WASHER
DRIVE SHAFT
BRACE
FRAME
INTERMEDIATE GEAR SHAFT (NOT SHOWN)
SET SCREW
SIDE MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF ASSEMBLY
CLEVIS
DRIVE SHAFT YOKE
COTTER PIN
CLEVIS PIN
LOCK WASHER
NUT
STUD

RA PD 77033

*Figure 190—Side Mounting to Auxiliary Transmission Power Take-off Assembly*

## 136. SIDE MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF AND LNKAGE.

**a. Description.** The side mounting to auxiliary transmission power take-off assembly is bolted to the right side of the auxiliary transmission case. Power taken from the auxiliary transmission is transmitted through a drive shaft to the front mounted winch assembly. The front winch control lever is located in the driver's compartment, just below the driver's seat. A shift fork, secured to a shift rod, moves the intermediate gear in the assembly to obtain reverse, low, or high speeds, as desired.

**b. Removal of Side Mounting to Auxiliary Transmission Power Take-off Assembly** (fig. 190).

(1) DISCONNECT LINKAGE. Remove muffler (par. 93). Disconnect shift rod from power take-off assembly by removing cotter and clevis pins which secure shift rod clevis yoke to shift rod end. Lower shift rod out of way, and disconnect drive shaft yoke from intermediate gear shaft by loosening socket head set screw in yoke from intermediate gear shaft by loosening socket head set screw in yoke. Disconnect supporting brace from auxiliary transmission case by removing two cap screws and lock washers.

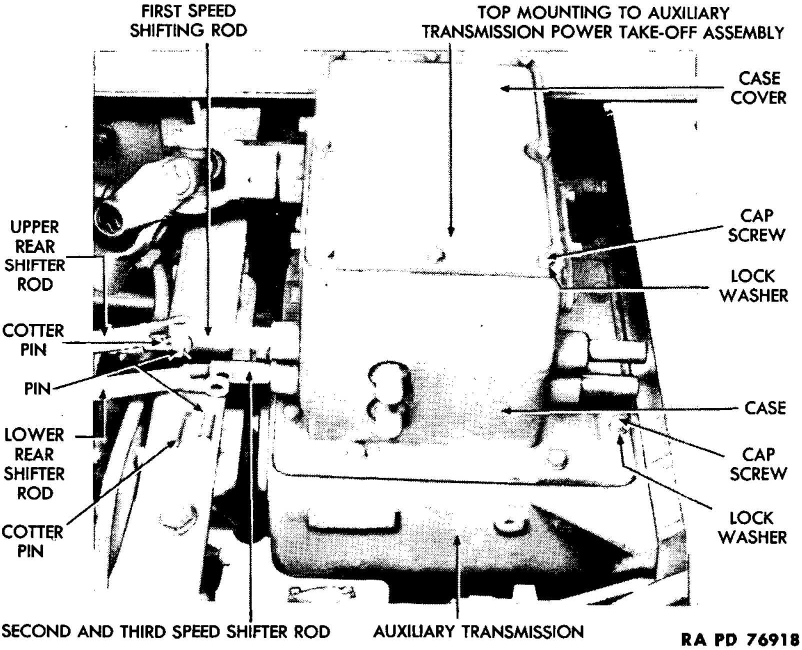
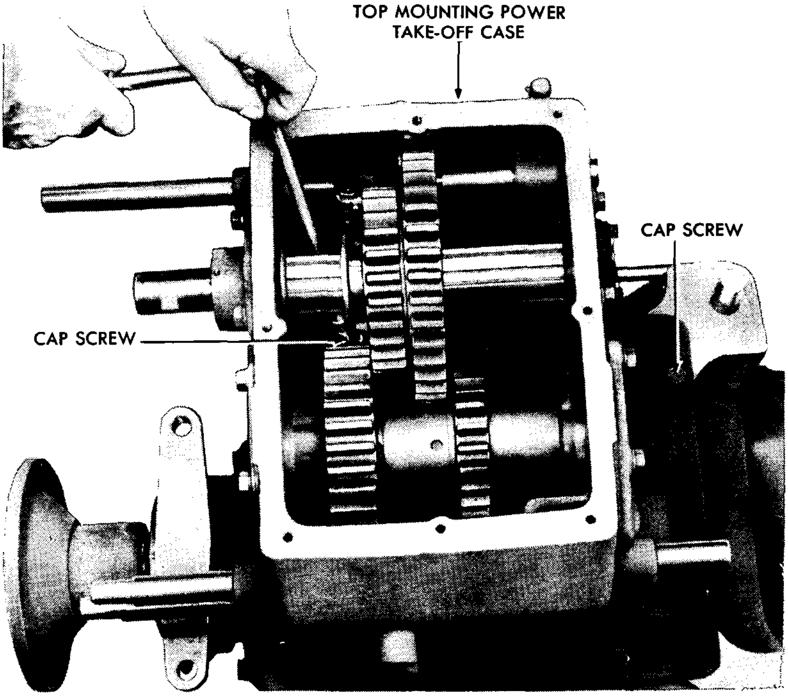

FIRST SPEED SHIFTING ROD
TOP MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF ASSEMBLY
CASE COVER
CAP SCREW
LOCK WASHER
UPPER REAR SHIFTER ROD
COTTER PIN
PIN
CASE
LOWER REAR SHIFTER ROD
CAP SCREW
LOCK WASHER
COTTER PIN
SECOND AND THIRD SPEED SHIFTER ROD
AUXILIARY TRANSMISSION
RA PD 76918

*Figure 191—Removal of Top Mounting to Auxiliary Transmission Power Take-off*

(2) REMOVE POWER TAKE-OFF. Remove six nuts and lock washers which hold power take-off to auxiliary transmission case and pull power take-off from studs. Pull assembly back until intermediate gear shaft is pulled free of drive shaft yoke, and remove power take-off assembly. Remove two auxiliary transmission case to side mounting power take-off gaskets and side mounting power take-off filler block from studs on auxiliary transmission case.

**c. Installation of Side Mounting to Auxiliary Transmission Power Take-off Assembly (fig. 190).**

(1) INSTALL POWER TAKE-OFF. Cement a new power take-off gasket to auxiliary transmission case and similar gasket to side mounting power take-off case. Position filler block over studs on auxiliary transmission case. Lift power take-off assembly into position, sliding end of intermediate gear shaft into drive shaft yoke, and position power take-off assembly on studs. Secure assembly to auxiliary transmission case with six nuts and lock washers. Then install two cap screws and lock washers which hold brace to auxiliary transmission case.



RA PD 74878

*Figure 192—Removing Top Mounting to Auxiliary Transmission Power Take-off Cap Screws*

(2) CONNECT LINKAGE. Lift shift rod into position with clevis over shift rod end and secure clevis to end with clevis pin and cotter pin. Tighten socket head set screw in drive shaft yoke, securing yoke to intermediate gear shaft. Install muffler (par. 93).

**d. Controls and Linkage.** Removal and installation of controls and linkage are covered in paragraph 137.

## 137. TOP MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF AND LINKAGE.

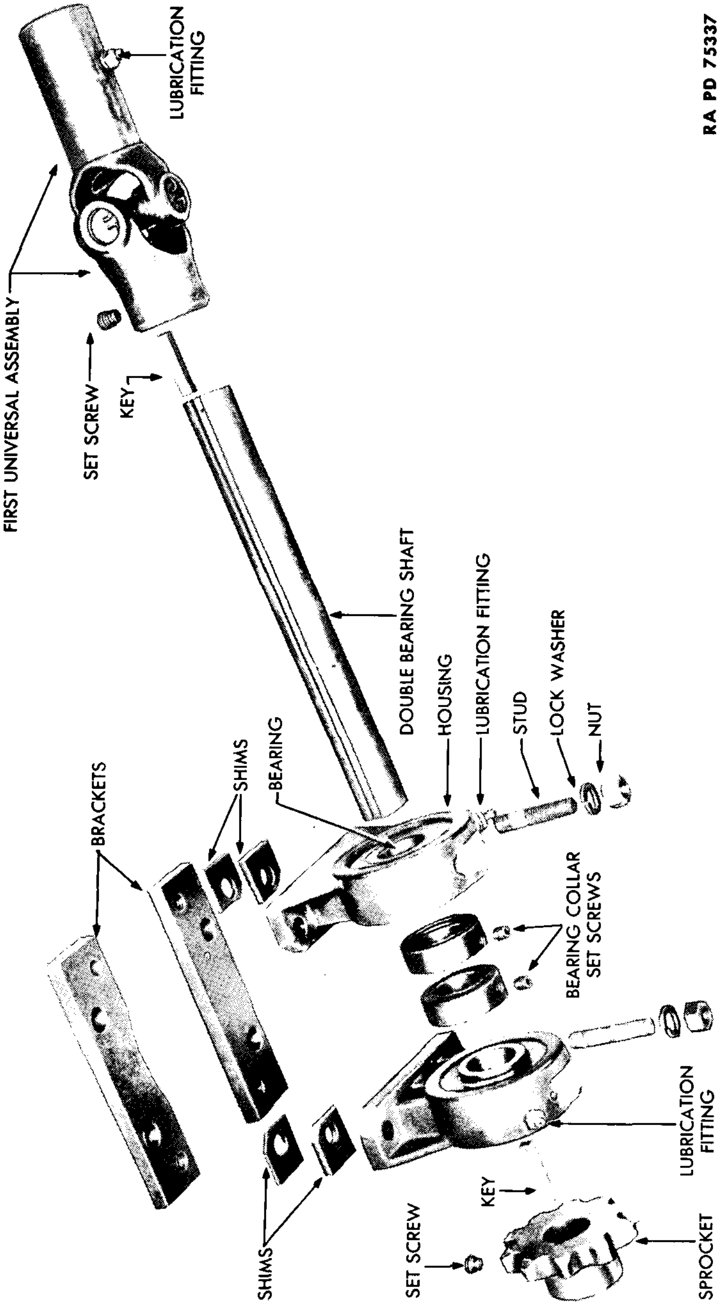
**a. Description.** The top mounting to auxiliary transmission is mounted on top of the auxiliary transmission. It serves to transmit power to the front and rear tandem winches. A tandem winch universal joint assembly transmits power from the power take-off assembly to a drive sprocket which is connected by a chain to a driven sprocket on the tandem winch assembly. Power applied to either, or both, front and rear tandem winch assemblies by the power take-off is controlled by means of the winch control levers. These levers are located on the winches and connected to the power take-off shift rods by means of straight rods with clevises at each end.

**b. Removal of Top Mounting to Auxiliary Transmission Power Take-off.** Proceed as outlined in paragraph 136.

**c. Installation of Top Mounting to Auxiliary Transmission Power Take-off.** Proceed as outlined in paragraph 136.

**d. Removal of Controls and Linkage** (fig. 191). From underneath vehicle, remove cotter and link pins which secure two links to shifter rod at right front of top mounting to auxiliary transmission power take-off. Remove links by removing top cotter and link pins. Procedure for removal of remaining controls and linkage between power take-off and tandem winch assembly is given in paragraph 202.

**e. Installation of Controls and Linkage** (fig. 191). Install two links to shifter rod at right front rod of top mounting to auxiliary transmission power take-off, securing links to rod with link and cotter pins. Secure top ends of links to lever with another link and cotter pin. The procedure for installation of remaining controls and linkage between power take-off and tandem winch assembly is given in paragraph 202.


LUBRICATION FITTING
FIRST UNIVERSAL ASSEMBLY
SET SCREW
KEY
DOUBLE BEARING SHAFT
HOUSING
LUBRICATION FITTING
STUD
LOCK WASHER
NUT
BRACKETS
SHIMS
BEARING
BEARING COLLAR SET SCREWS
LUBRICATION FITTING
SHIMS
SET SCREW
KEY
SPROCKET

RA PD 75337

Figure 193—Double Bearing—Disassembled

## Section XXI

## PROPELLER SHAFTS AND UNIVERSAL JOINT ASSEMBLIES

Paragraph
Description and data . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 138
Removal . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 139
Installation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 140

### 138. DESCRIPTION AND DATA.

**a. Description** (fig. 193). Three propeller shaft and universal joint assemblies are used in the vehicle. One transmits power from the main transmission to the auxiliary transmission. Another transmits power from the auxiliary transmission to the rear differential and carrier assembly to propel the rear wheels. The third transmits power from the declutch assembly to the front differential and carrier assembly.

**b. Data.**

| Unit | Make | Model |
|---|---|---|
| Main transmission to auxiliary transmission propeller shaft assembly | Spicer | 1701-1D1X with 7008-1X joint set |
| Main transmission companion flange | Spicer | 6-1-951 |
| Auxiliary transmission companion flange | Spicer | 6-1-884 |
| Transfer case to front axle propeller shaft assembly | Spicer | 1701-1X with 1708-1X joint set |
| Front axle companion flange | Spicer | 6-1-591 |
| Auxiliary transmission to rear axle propeller shaft assembly | Spicer | 1801-1X with 1808-1X joint set |
| Auxiliary transmission companion flange | Spicer | K6 1/2-1-64 |
| Rear axle companion flange | Spicer | K6 1/2-1-81 |

### 139. REMOVAL.

**a. Removal of Transfer Case to Front Axle Propeller Shaft and Universal Joint Assembly.**

(1) DISCONNECT COMPANION FLANGES AT DIFFERENTIAL AND CARRIER ASSEMBLY (fig. 193). Remove eight bolts, nuts, and lock washers which secure two companion flanges together at differential and carrier assembly at front end of the propeller shaft. Then unscrew universal slip yoke dust cap at rear of shaft and pull splined end of shaft from universal slip joint yoke.

(2) REMOVE REAR UNIVERSAL JOINT (fig. 193). Pry back two bearing cap lock straps from cap screws which hold two bearing caps to universal sleeve yoke (rear). Remove two cap screws from each bearing cap and remove two bearing caps. Pry rear yoke so one universal joint bearing assembly can be removed from yoke and journal.

Pry rear yoke in opposite direction to remove second bearing assembly. Remove front slip joint yoke with journal attached. This provides access to declutch shaft nut which holds rear yoke to declutch shaft. Remove cotter pin and declutch shaft nut and pull universal sleeve yoke from declutch shaft.

**b. Removal of Main Transmission to Auxiliary Transmission, Propeller Shaft and Universal Joint Assembly** (fig. 193). Remove eight bolts, nuts, and lock washers which secure flange at front end of propeller shaft to companion flange at main transmission (fig. 184). Unscrew dust cap, lower slip joint yoke from companion flange at main transmission and pull slip joint yoke from sleeve yoke at rear of propeller shaft. Remove eight bolts, nuts, and lock washers which secure flange at rear of propeller shaft to companion flange at auxiliary transmission and lower assembly (fig. 184). Remove rear universal joint assembly and sleeve yoke.

**c. Removal of Transfer Case to Rear Axle Propeller Shaft and Universal Joint Assembly.** Remove eight nuts and lock washers which secure universal flange yoke to companion flange at drive shaft brake drum. Then remove eight bolts, nuts, and lock washers which secure propeller shaft front flange to companion flange on transfer case at rear of auxiliary transmission. Remove assembly, pulling rear universal joint and flange yoke from companion flange.

## 140. INSTALLATION.

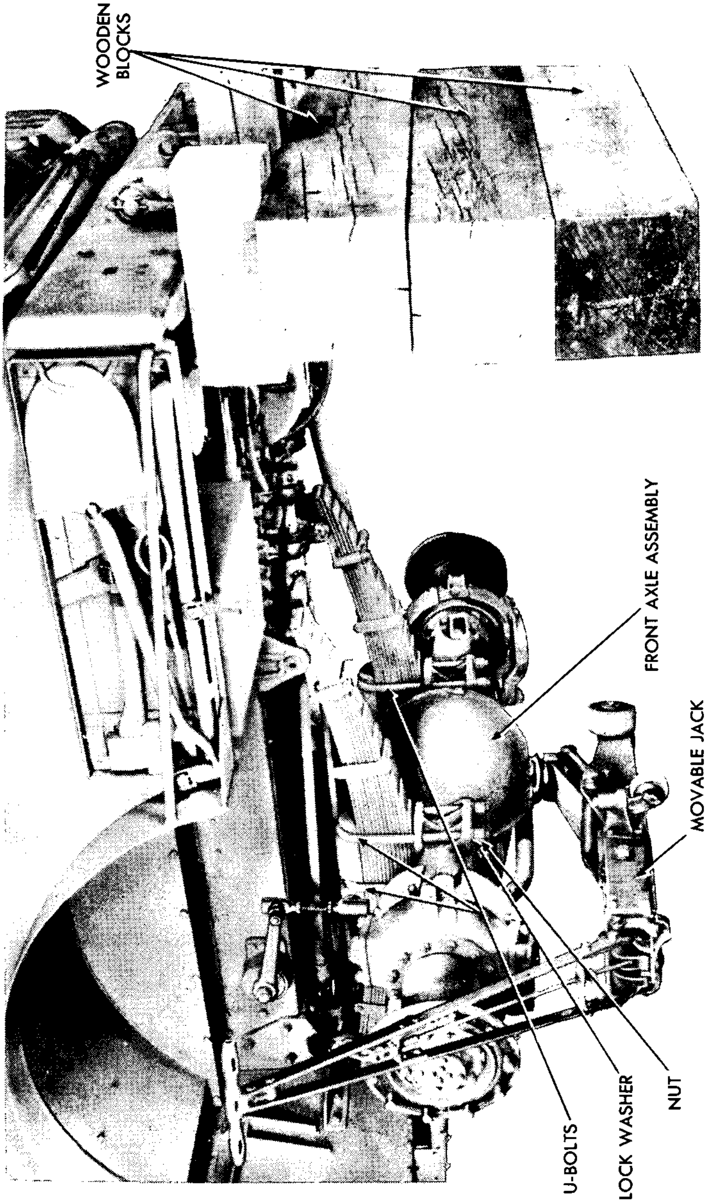
**a. Installation of Transfer Case to Front Axle Propeller Shaft and Universal Joint Assembly.**

(1) INSTALL REAR UNIVERSAL JOINT (fig. 193). Slide universal sleeve yoke onto declutch shaft, secure it with declutch shaft nut, and lock nut with a cotter pin. Install new gaskets on two universal journal gasket retainers on two opposing ends of journal which has slip joint yoke attached. Then insert slip joint yoke with journal attached into position in sleeve yoke, with journal through sleeve yoke holes. Tap a universal bearing assembly into position over two journal ends and into yoke. Install a universal bearing cap and bearing lock strap over each bearing, securing cap and strap to yoke with two cap screws. Bend lock strap nibs around cap screws.

(2) INSTALL FRONT UNIVERSAL JOINT (fig. 193). Insert splined end of front universal joint into universal slip joint yoke and tighten dust cap. Lift companion flange of universal joint into position against companion flange at front differential and carrier assembly and secure two flanges together with eight bolts, nuts, and lock washers.

**b. Installation of Main Transmission to Auxiliary Transmission Propeller Shaft and Universal Joint Assembly** (fig. 193). Install companion flange of rear universal joint assembly to companion flange at auxiliary transmission, securing flanges together with eight bolts, nuts, and lock washers. Then insert slip joint yoke of front universal joint assembly into sleeve yoke of rear universal joint assembly and tighten dust cap. Lift companion flange of front universal joint assembly into position against companion flange at main transmission and secure the two flanges together with eight bolts, nuts, and lock washers.

c. **Installation of Transfer Case to Rear Axle Propeller Shaft and Universal Joint Assembly** (fig. 193). Lift propeller shaft into position with rear universal joint flange yoke over bolts which hold companion flange at drive shaft brake drum. Secure rear universal joint flange yoke to companion flange with eight nuts and lock washers. Secure front universal joint companion flange to companion flange at transfer case with eight bolts, nuts, and lock washers.


WOODEN BLOCKS
FRONT AXLE ASSEMBLY
MOVABLE JACK
U-BOLTS
LOCK WASHER
NUT

RA PD 76963

Figure 194—Front Axle Installed

## Section XXII

## FRONT AXLE

Paragraph
Description and data ........................................ 141
Tie rod and toe-in adjustment ........................................ 142
Removal ........................................ 143
Installation ........................................ 144

### 141. DESCRIPTION AND DATA.

**a. Description.** The front axle assembly consists of a banjo type housing which houses the two front axle shafts and the differential and carrier which is mounted in the housing at the center. An axle shaft on each side of the differential carrier assembly is connected by splines to differential side gears. Each axle shaft is connected at the outer end to a universal joint which is housed in a trunnion socket assembly. The axle is the full-floating type, designed so the entire wheel assembly and load are carried independent of the axle shaft. A hub assembly is attached to the outer end of each trunnion socket assembly. The steering tie rod is secured to lower arms at the bottom of each trunnion socket. A declutch assembly attached to the transfer case supplies power through a propeller shaft to the driving flange of the front differential and carrier assembly, which in turn drives the front axle shafts.

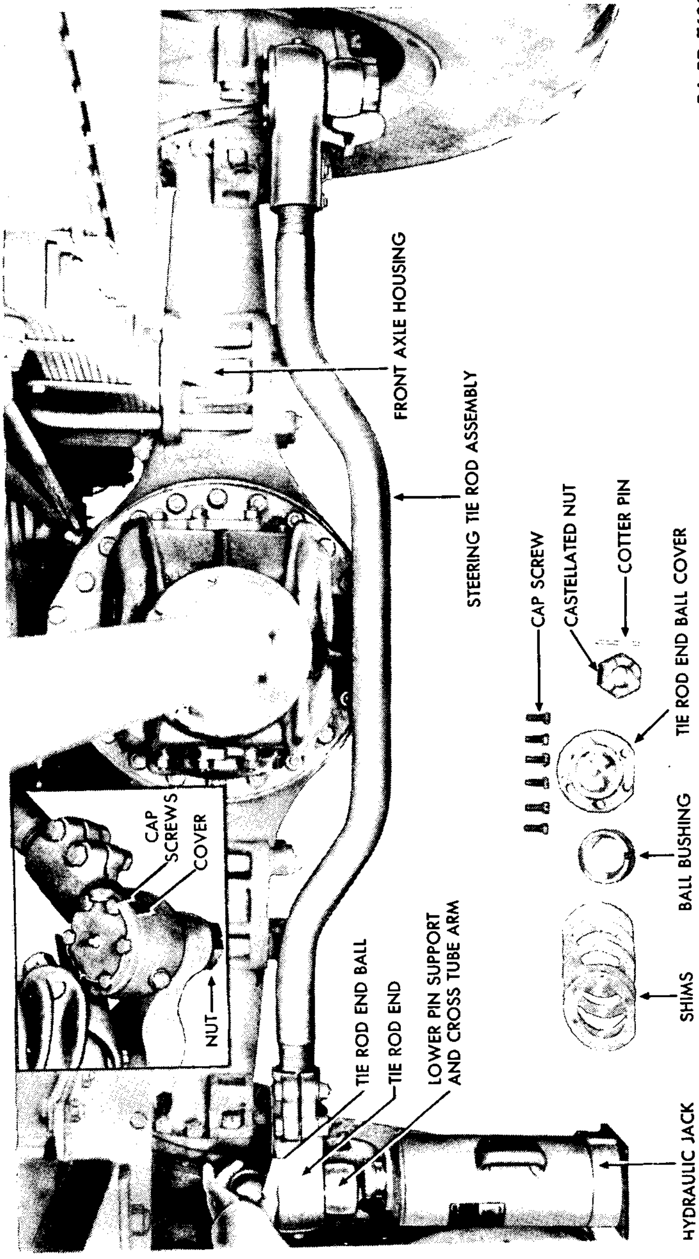
**b. Data.**

| | |
|---|---|
| Make | Timken |
| Model | F 7900-A752 |
| Gear ratio | 7.69 to 1 |

### 142. TIE ROD AND TOE-IN ADJUSTMENT.

**a. Description** (fig. 195). The steering tie rod assembly consists of a tube with adjustable ends threaded and clamped to each end of the tube. The tie rod joins the two lower pin support and cross tube arms together at the rear of the front axle housing. When the steering wheel is turned, the steering knuckle to which the left-hand arm is attached turns accordingly, and by means of the tie rod, the right-hand arm and steering knuckle are turned at the same time.

**b. Toe-in Adjustment.** Toe-in is the angle to which the wheels point inward at the front. It is designed to maintain proper steering and to eliminate scuffing, dragging, and scrubbing of the tires on the road. Toe-in adjustment is made at the tie rod (fig. 195). Each end of the rod is threaded. The left-hand end has a coarse thread and the right-hand end, a fine thread. The tie rod ends screw on these threads and are clamped tight by two tie rod end clamp bolts. In addition, the right-hand tie rod end is secured by a lock nut which is also screwed on the end of the tie rod. Toe-in adjustments are usually made at the fine threaded end of the tie rod.


FRONT AXLE HOUSING
STEERING TIE ROD ASSEMBLY
CAP SCREW
CASTELLATED NUT
COTTER PIN
TIE ROD END BALL COVER
BALL BUSHING
SHIMS
CAP SCREWS
COVER
NUT
TIE ROD END BALL
TIE ROD END
LOWER PIN SUPPORT AND CROSS TUBE ARM
HYDRAULIC JACK

RA PD 76861

Figure 195—Removal of Steering Tie Rod Assembly

## FRONT AXLE

(1) Scribing the Tires. With front wheels in a straight ahead position, place jacks under each end of front axle housing and raise both wheels about ½ inch (fig. 196). Place tire scriber in front of the tire so that its needle touches center of tire tread. Then spin wheel to scribe a line completely around tread (fig. 196). Repeat operation on opposite front tire. Release jacks, allowing wheels and tires to rest on ground.

(2) Checking Toe-in. Place toe-in gage at rear of front wheels. Loosen toe-in gage pointer screw which controls vertical position of toe-in gage pointer, and slide pointer upward until it rests against scribed line on tire at hub height. Loosen toe-in gage scale indicator screw (fig. 197), and slide toe-in gage scale indicator along gage until it is at zero on scale. Tighten indicator screw. Carry toe-in gage around to front of wheels. Place gage so that one pointer is at scribed line on one tire. If toe-in adjustment is correct, opposite pointer will touch tire on the outside of scribed line. The distance of pointer to line (amount of toe-in) should be ⅛ inch and must not vary more than plus or minus 1/32 inch. Otherwise, adjustment is necessary.

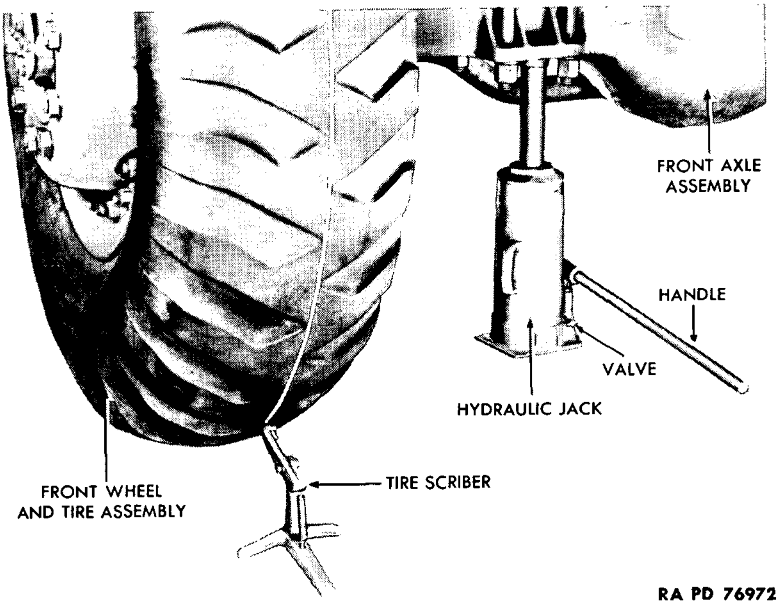
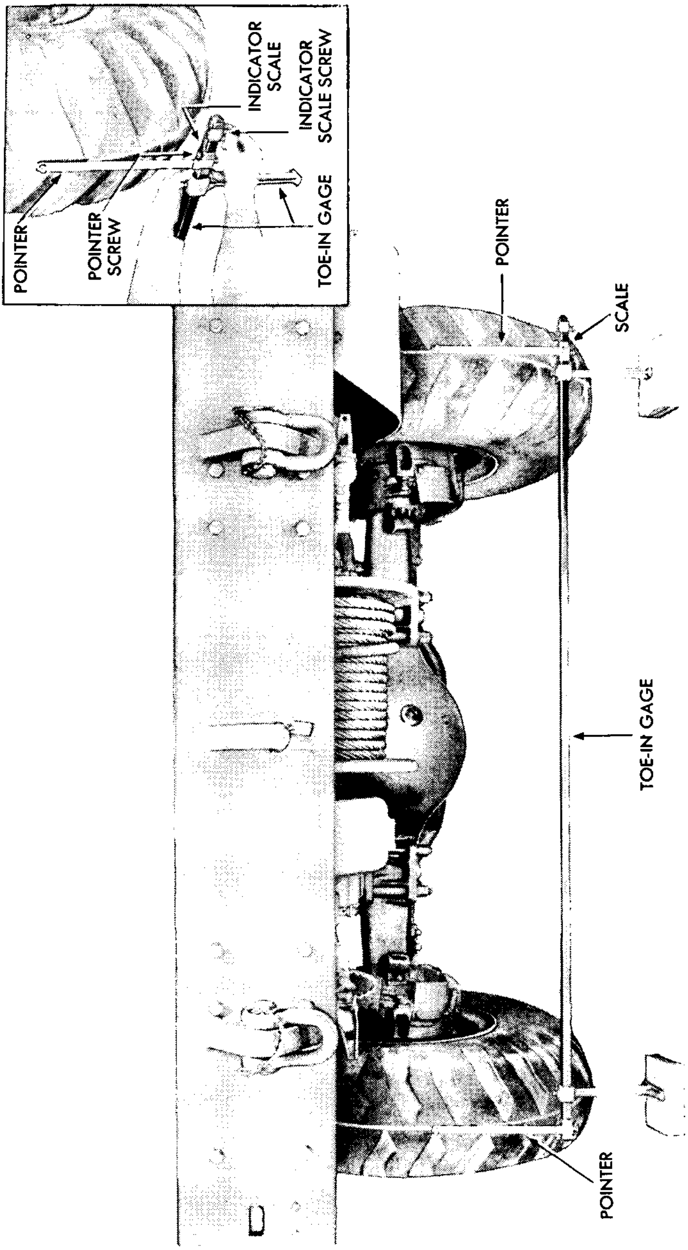


Figure 196—Scribing Tire

(3) Adjusting Toe-in. Remove cotter pin and nut on right-hand end of tie rod end ball, then remove wire and cap screws that hold cover and remove cover. Remove tie rod end ball, and loosen tie rod end clamp bolts. Turn tie rod end one turn for each ⅛-inch toe-in


POINTER
POINTER SCREW
TOE-IN GAGE
INDICATOR SCALE
INDICATOR SCALE SCREW
POINTER
SCALE
TOE-IN GAGE
POINTER

RA PD 77051

*Figure 197—Indicating Amount of Toe-in*

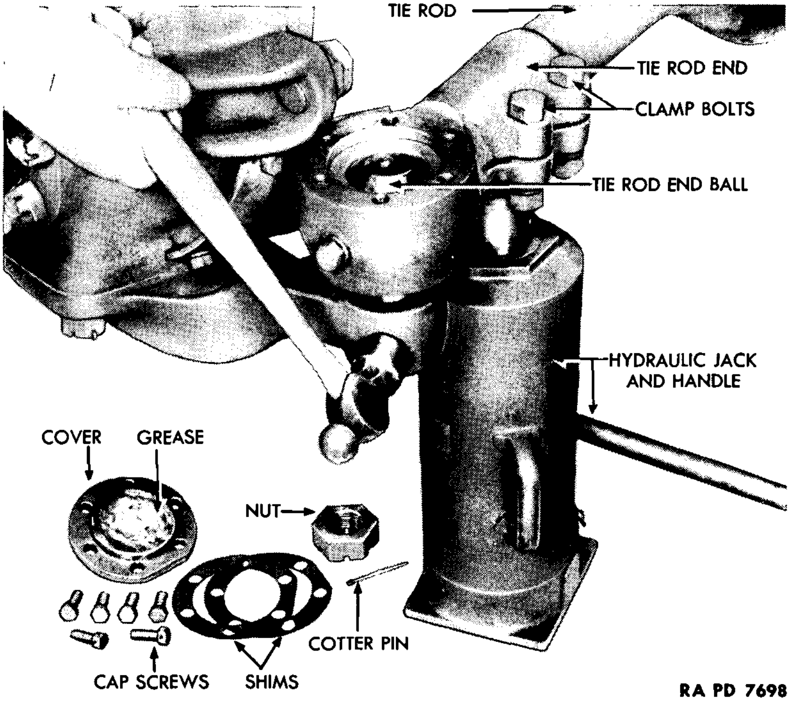


*Figure 198—Removing Tie Rod End*

adjustment. One turn of right-hand tie rod end onto tie rod decreases toe-in by 1/8 inch, and one turn off tie rod increases toe-in by 1/8 inch. If amount of toe-in adjustment necessary is too great to be made at right-hand fine thread tie rod end, disconnect left-hand tie rod end. Loosen clamp bolts and turn tie rod end one turn. Tighten clamp bolts and connect end. Then continue the adjustment at right-hand tie rod end. When adjustment has been made, tighten clamp bolts, and connect tie rod end to axle. Test toe-in again to check accuracy of adjustment.

c. **Remove Tie Rod** (fig. 195). Remove lock wire and six cap screws which secure tie rod end ball cover on tie rod end. Remove cover and shims from tie rod end: Then remove cotter pin and castellated nut from bottom of tie rod end ball, place a jack under tie rod end, and lift it up about an inch. Tap lower pin support and cross tube arm so tie rod end and ball will move up and out of arm. Place jack under tie rod end ball and drive tie rod end down against arm, thus moving tie rod end ball and ball bushing upward so bushing and ball can be lifted out. Leave tie rod end rest on arm, repeat procedure to remove tie rod end ball from other end of tie rod, and lift tie rod out.

**d. Install Tie Rod** (fig. 195). Lift tie rod onto two lower pin support and cross tube arms. Insert tie rod end ball at one end of tie rod and secure ball to arm with castellated nut and cotter pin. Install ball bushing on top of ball and install shims and cover. Secure cover with three of six cap screws and check for play of tie rod end ball. If play exists, remove one shim and recheck. Repeat this procedure as required to eliminate play and then install three remaining cap screws which hold cover to tie rod end. Lock cap screws with wire. Repeat procedure at opposite end of tie rod. Check front wheel toe-in as outlined in subparagraph **b** above.

## 143. REMOVAL.

**a. Preliminary Instructions.** Place heavy, long wooden blocks under front bumper to support the front end of the vehicle when wheels and front axle assembly are removed. Place heavy wooden blocks at front and rear of rear tires in order to prevent vehicle from sliding off blocks after front axle has been removed. Support center of front axle on a jack. Remove wheels and tires (par. 175).

**b. Disconnect Steering Drag Link** (fig. 194). Remove the cotter pin which locks threaded adjustment screw in rear end of steering drag link, and remove screw. Reach into end of drag link and remove steering drag link spring and spring retainer. Position steering wheel so as to center drag link over steering arm ball stud, and lift drag link upward and off stud.

**c. Remove U-bolts** (fig. 194). Remove two nuts and lock washers from each U-bolt, which secure front axle to right front spring. Remove nuts and lock washers from U-bolts which hold front axle to left front spring.

**d. Disconnect Propeller Shaft.** Remove eight bolts, nuts, and lock washers which secure two companion flanges at differential assembly.

**e. Remove Front Axle** (fig. 194). Lower front axle jack as low as possible and tap four U-bolts upward so they are free of front axle housing. CAUTION: *Rest assembly on jack so it will not fall, and pull assembly out from beneath vehicle.*

## 144. INSTALLATION.

**a. Preliminary Instructions.** Use a hoist to lift front axle into position beneath front springs, with U-bolt holes in front axle housing alined with front spring U-bolts.

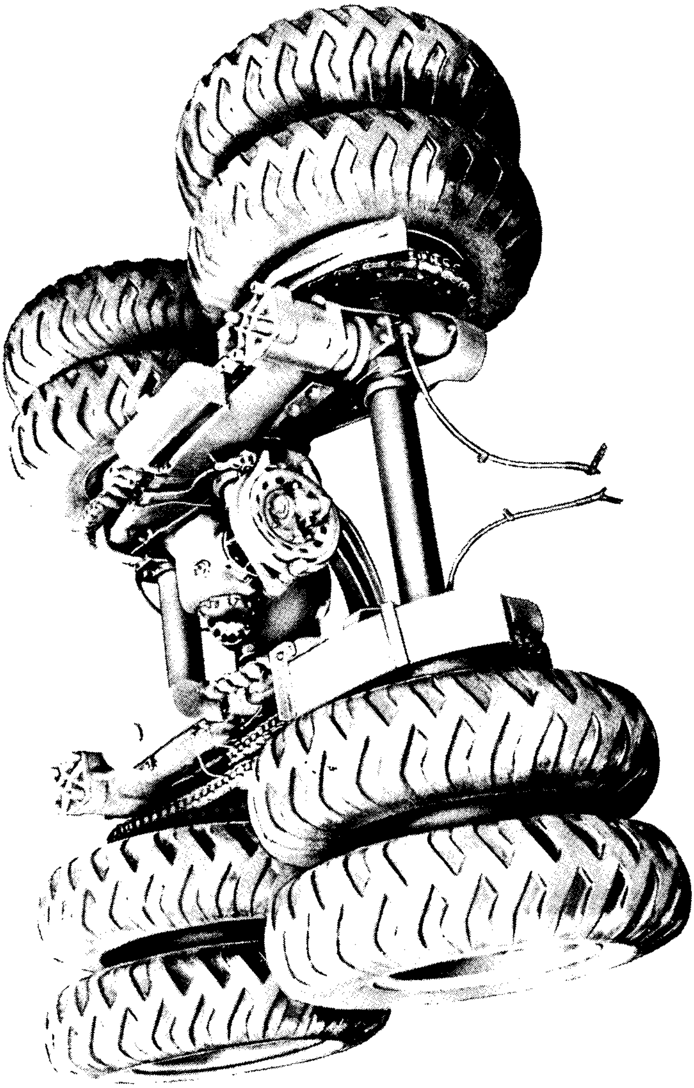
**b. Install Front Spring U-bolts.** Jack up front axle so that housing is next to the springs, then tap U-bolts at each spring down through bolt holes in axle housing and secure each bolt with lock washer and nut.

**c. Connect Steering Drag Link.** Push rear end of drag link down over steering arm ball stud. Install spring retainer in steering drag link spring and install retainer and spring into end of drag link. Then install threaded adjustment screw in end of drag link and tighten screw until spring tension is partially taken up. Lock screw by inserting a cotter pin through drag link and slot in screw.

**d. Connect Propeller Shaft.** Install eight bolts, nuts, and lock washers which secure two companion flanges at differential assembly.

**e. Install Wheels and Tires.** Install wheels and tires (par. 142). Then remove blocks from under front bumper and remove jack from beneath front axle housing.

**f. Aline Front Wheels.** Aline front wheels (par. 142).



RA PD 74835

Figure 199—Rear Axle Tandem Unit

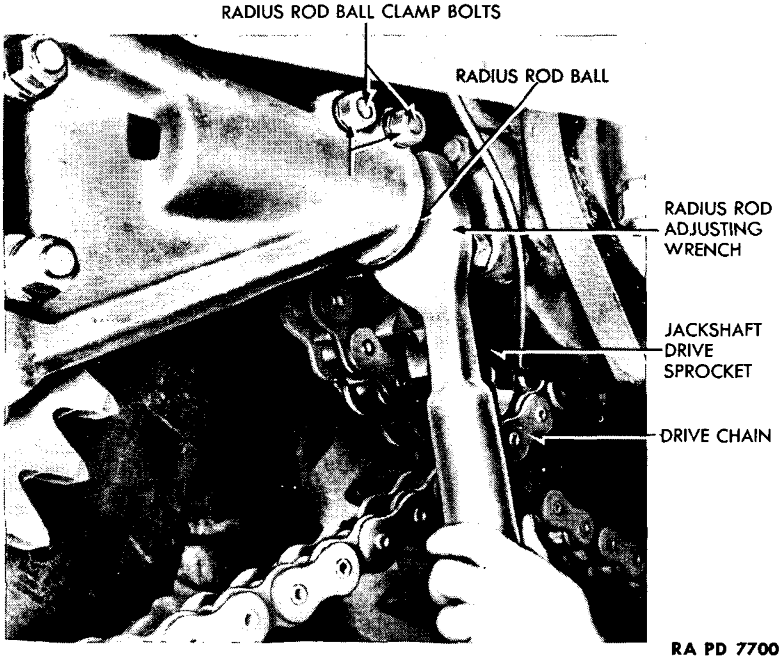
## Section XXIII

# REAR AXLE TANDEM UNIT

Paragraph
Description and data for tandem unit .................... 145
Drive chains .................... 146
Drive chain oil tank .................... 147
Jackshaft axle shafts .................... 148
Jackshaft hubs and sprockets .................... 149
Tandem unit removal .................... 150
Tandem unit installation .................... 151

## 145. DESCRIPTION AND DATA FOR TANDEM UNIT.

a. **Description.** The rear of the vehicle is supported by a tandem axle suspension. Power is supplied to the rear axle tandem unit assembly by a propeller shaft from the auxiliary transmission to the rear differential and carrier assembly. Two jackshaft drive sprockets drive the stationary axle drive sprockets which are attached to the hubs on the two stationary carrier axles by means of drive chains. Two wheels are secured to each stationary axle hub. Thus the driving power is applied to all eight wheels of the rear axle tandem unit assembly. The jackshaft housing is supported at each end in a bushing


RADIUS ROD BALL CLAMP BOLTS
RADIUS ROD BALL
RADIUS ROD ADJUSTING WRENCH
JACKSHAFT DRIVE SPROCKET
DRIVE CHAIN

RA PD 77001

*Figure 200—Adjustment of Radius Rods*

in a side stabilizer beam. The two carrier axle assemblies at front and rear of the jackshaft assembly support one end of each side stabilizer beam on a stabilizer block and the other end on a leaf spring. The leaf spring in turn supports the inner spring case which houses the two coil springs at the end of each side stabilizer beam. Radius rods attached to the service brake spider at each end of each stationary carrier axle are secured to the side stabilizer beams by radius rod ball caps. The radius rods are adjustable to permit adjusting of the drive chains to their proper tension. Each of the two stationary axle beams are secured to a side stabilizer beam and to a cross rod thrust plate on the jackshaft housing.

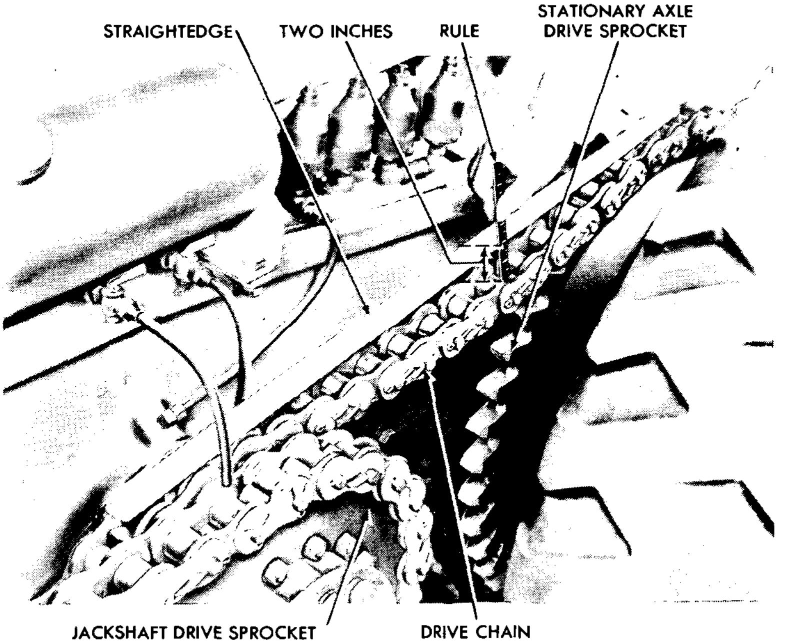


*Figure 201—Measuring Slack in Drive Chain*

**b. Data.**

Differential:

Make .............................. Timken
Model .............................. 1828B2

## 146. DRIVE CHAINS.

**a. Description** (fig. 200). Two roller chains located at each side of the rear axle tandem unit drive the rear wheels. Each chain is driven by a jackshaft drive sprocket and the chain in turn drives a sprocket which is attached to the brake drum and wheel hub. Chains are lubricated by two oil tanks which are mounted on top of the side stabilizer beams.

**b. Adjustment** (figs. 200 and 201). Loosen two radius rod ball clamp bolts on radius rod. Use radius rod adjusting wrench to loosen or tighten radius rod ball to obtain two inches of slack in chain at coil spring end or four inches of slack in chain at opposite end. Place a straightedge over links of chain, with ends of straightedge resting on top of chain over sprockets. At a point midway between sprockets, hold a ruler perpendicular to chain and depress chain as far as possible, so all slack is taken up in chain at bottom. The measurement should be one half of required slack, or one inch for chains at the coil spring ends, and two inches for chains at the opposite ends. Always adjust all four drive chains at one time.

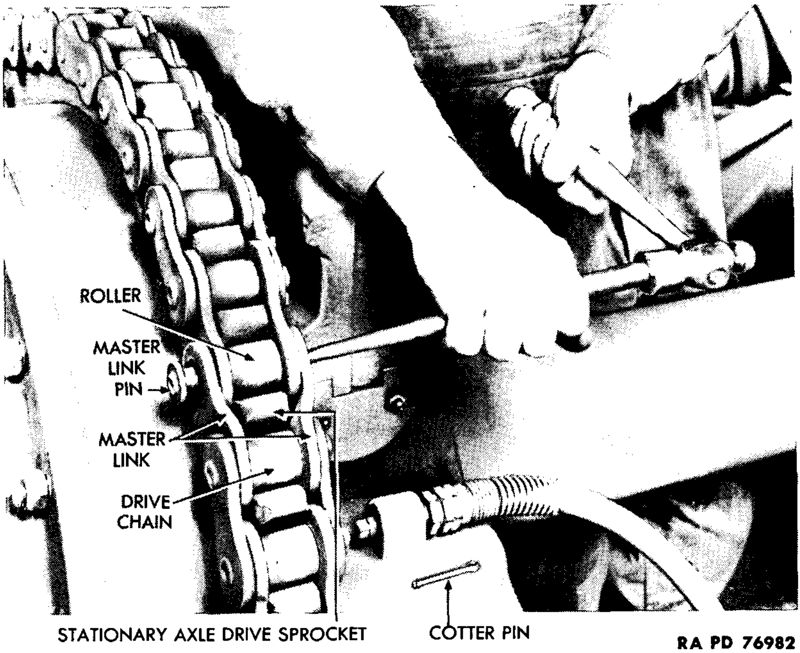


*Figure 202—Removal of Drive Chain*

**c. Removal** (fig. 202). Move vehicle so that master link is over stationary axle drive sprocket. Remove cotter pin from end of master link pin and remove link. Lift chain from sprockets. Remove remaining chains in the same manner. Remove and wash drive chains in hot oil every 1,000 miles of operation.

**d. Repair** (figs. 203 and 204).

(1) REMOVE LINKS. Place the chain in chain vise, with vise jaws

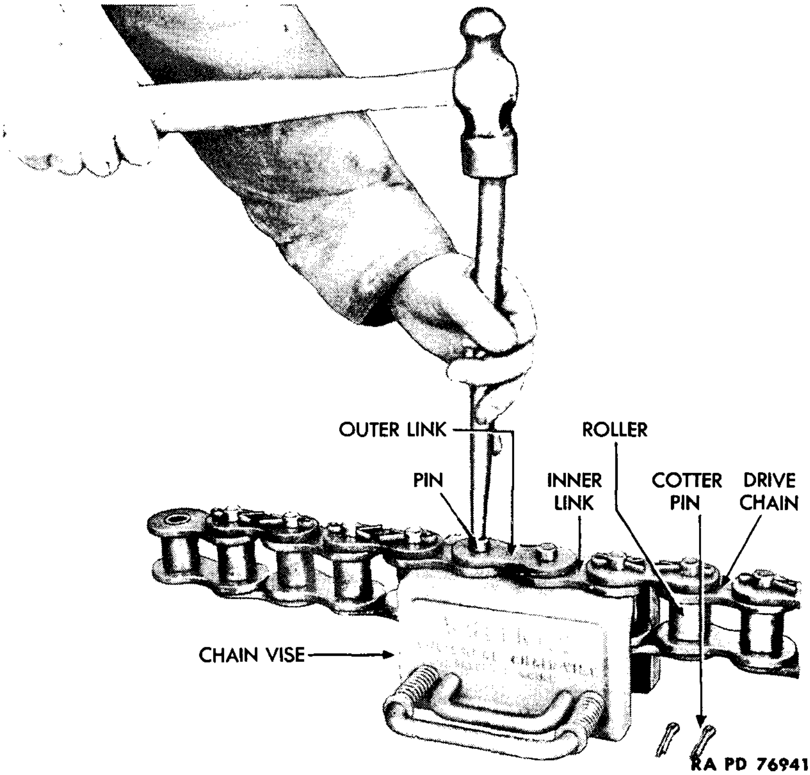


*Figure 203—Removal of Chain Link*

next to inner links, facing cotter pins, with link to be removed in center of vise. Then remove two cotter pins from link pins and drive two pins and link from chain. Remove additional links in the same manner as required to remove other outer and inner links or rollers which may be damaged.

(2) INSTALL NEW LINKS. Install new parts, assembling rollers between inner links, as required. Connect inner links and rollers by inserting link with two pins attached in inner links and rollers. Place chain in chain vise, with vise jaws next to inner links opposite cotter pin side of chain. Tap link into position through inner links and rollers and install cotter pins in link pins. Repeat procedure if necessary to install additional outer links.

**e. Installation** (fig. 202). Lift chain in position over jackshaft drive sprocket and stationary axle drive sprocket so that open ends of chain will be over stationary axle drive sprocket. Tap master link pin into position through outer master links and inner link and roller. Secure master link pin with a cotter pin. Install remaining drive chains in same manner.

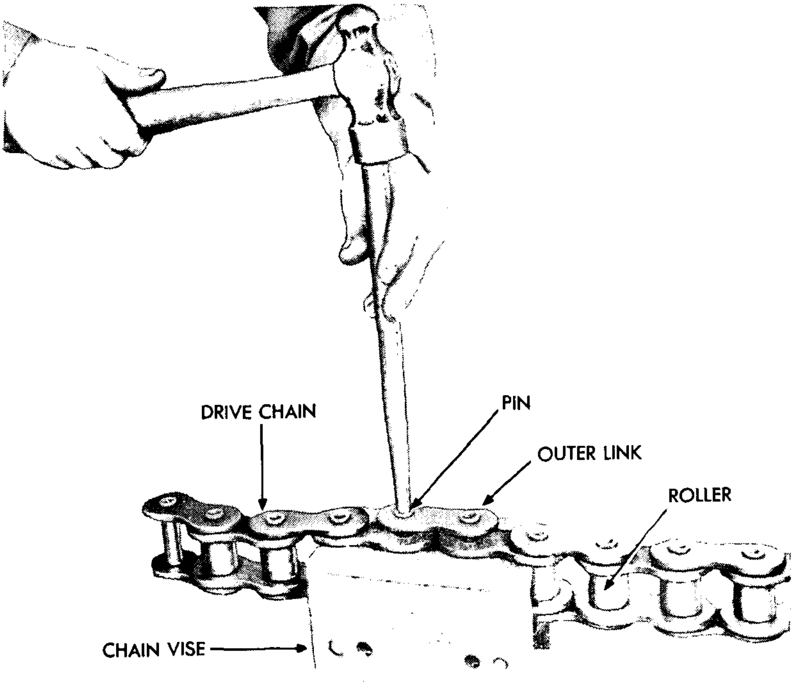


*Figure 204—Installation of Chain Link*

## 147. DRIVE CHAIN OIL TANK.

**a. Description** (fig. 205). A chain oiler tank with filler cap is secured to each side stabilizer beam. Two shut-off valves at the bottom of each tank permit a flow of oil through two copper tubes which expel oil when desired over the two chains and jackshaft drive sprocket on each side of the vehicle.

**b. Removal** (fig. 205). Remove four bolts, nuts, and lock washers which secure oil tank to brackets on side beam stabilizer and lift off tank. Remove tank from opposite side beam stabilizer in same way.

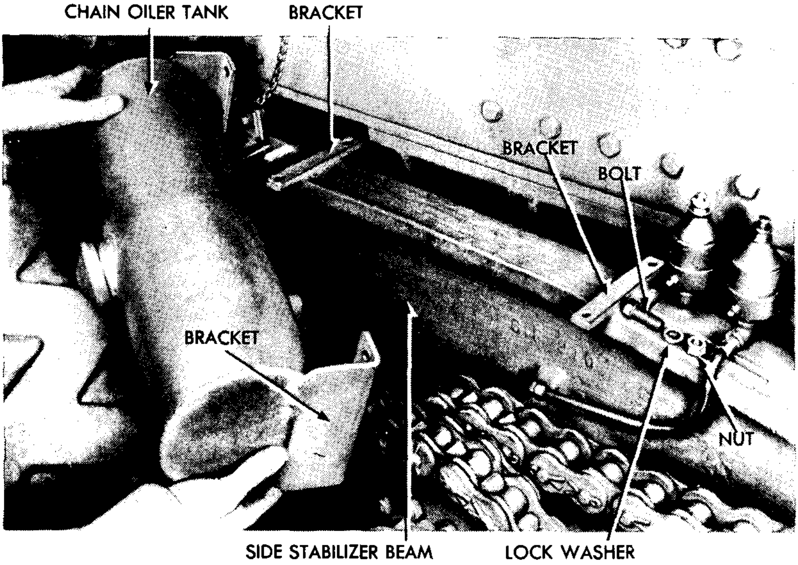
**c. Maintenance.** Remove filler cap and wash interior of tank with dry-cleaning solvent. Check mounting brackets to make certain they are securely welded to tank.

**d. Installation** (fig. 205). Lift chain oil tank into position on side stabilizer beam brackets. Then secure it to brackets with four bolts, nuts, and lock washers. Install remaining chain oil tank in same manner.

## 148. JACKSHAFT AXLE SHAFTS.

**a. Description.** The jackshaft axle drive shafts are enclosed in the jackshaft housing. Each shaft is splined on the inner end to mesh with the splines of the differential side gears. The outer ends of the shafts are flanged and are secured to the jackshaft hub studs. The drive shafts are driven by the differential side gears and in turn drive the jackshaft hubs and sprockets which drive the chains.

**b. Removal.** Hold drive sprockets from turning by inserting a rod in hole in side stabilizer beam and between sprocket teeth. Remove 14 nuts which hold axle shaft flange to hub studs. (Seven nuts have lock washers under them and seven have dowels, the dowels and lock washers being used alternately.) Remove lock washers and dowels. Install two puller screws in puller screw holes in axle shaft flange and break shaft free of studs. Pull axle shaft straight out from jackshaft hub and remove axle flange gasket. Remove opposite axle shaft in the same manner. NOTE: *To remove dowels, it may be necessary to pull shaft out slightly with puller screws, and then tap shaft back in place to loosen dowels so they can be lifted from the studs.*



RA PD 77002

*Figure 205—Removing Chain Oil Tank*

**c. Installation.** Cement a new axle shaft flange gasket on flange and push shaft into jackshaft housing so that splined end of shaft slides into differential side gear splines. Install seven dowels and lock washers (dowels and lock washers are used alternately on hub studs) and 14 nuts which hold jackshaft axle shaft to hub studs. Hold sprockets from turning by inserting a rod in hole in side stabilizer beam and between sprocket teeth and tightening nuts. Install opposite jackshaft axle shaft in same manner.

## 149. JACKSHAFT HUBS AND SPROCKETS.

**a. Description** (fig. 206). The jackshaft hub assemblies rotate on each end of the jackshaft housing on two roller bearings in each hub. The jackshaft axle shafts, driven by the differential side gears, are secured to studs on the two hubs, and drive the hubs. Two drive sprockets are secured to each hub by studs and nuts. The inner hub sprocket drives the chain to the rear stationary axle drive sprocket and the outer hub sprocket drives the chain to the front stationary axle drive sprocket.

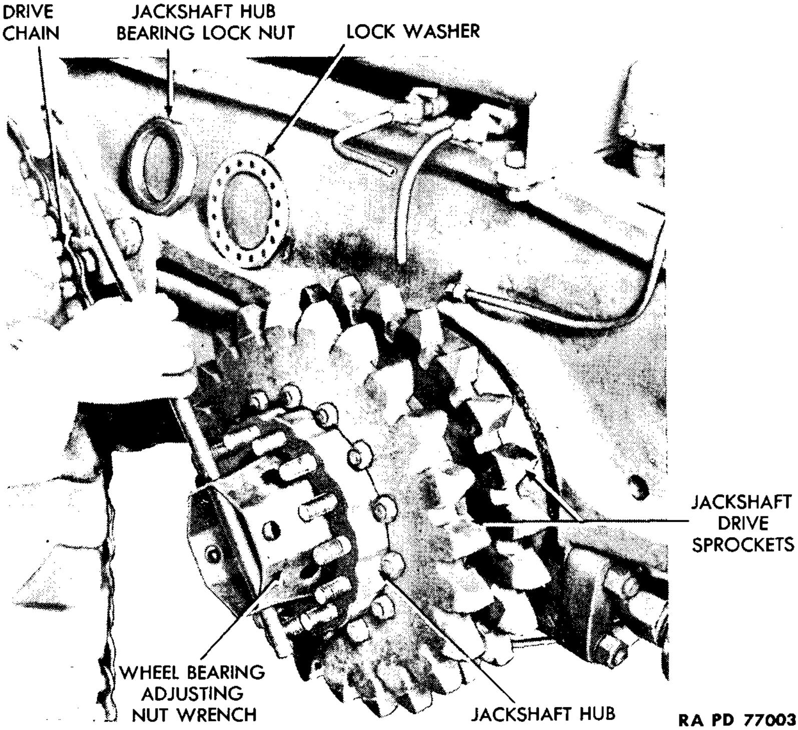

DRIVE CHAIN
JACKSHAFT HUB BEARING LOCK NUT
LOCK WASHER
JACKSHAFT DRIVE SPROCKETS
WHEEL BEARING ADJUSTING NUT WRENCH
JACKSHAFT HUB
RA PD 77003

*Figure 206—Removing Jackshaft Hub*

**b. Removal** (fig. 206).

(1) REMOVE HUB AND SPROCKETS ASSEMBLIES. Remove two drive chains from sprockets on side of vehicle from which jackshaft hub is to be removed (par. 146). Remove jackshaft axle shaft (par. 148). Remove jackshaft hub bearing lock nut from jackshaft tube with wheel bearing nut wrench. Remove jackshaft bearing lock washer and use wheel bearing adjusting nut wrench to remove jackshaft hub bearing adjusting nut. Remove shim and lift off hub with jackshaft drive sprockets attached. Remove remaining hub in same manner.

(2) REMOVE DRIVE SPROCKETS FROM HUB. Remove 14 nuts which hold outer jackshaft drive sprocket to studs on hub. Tap around sprocket teeth until sprocket is driven off hub. Remove 14 nuts which hold inner sprocket to studs on hub and drive studs back through sprocket; as the studs are driven back, remove sprocket stud sleeves and sleeve pins. Tap around sprocket teeth until sprocket is removed from hub. Remove sprockets from other hub in same manner.

c. **Installation** (fig. 206).

(1) INSTALL SPROCKETS ON HUBS. First screw a threaded sleeve on each of the 14 jackshaft drive sprocket studs. Aline each sleeve with pin notch in stud hole and install sleeve pins. Tap studs part way in, so other ends are flush with opposite side of hub. Place inner jackshaft drive sprocket over hub and tap around sprocket teeth until sprocket is in position against, and in alinement with, studs. Drive studs through stud holes in sprocket until studs are in fully installed position and secure sprockets to studs with nuts. Drive outer sprocket into position on hub over studs. Secure outer sprocket to hub by installing 14 nuts. Install sprockets on other hub in same manner.

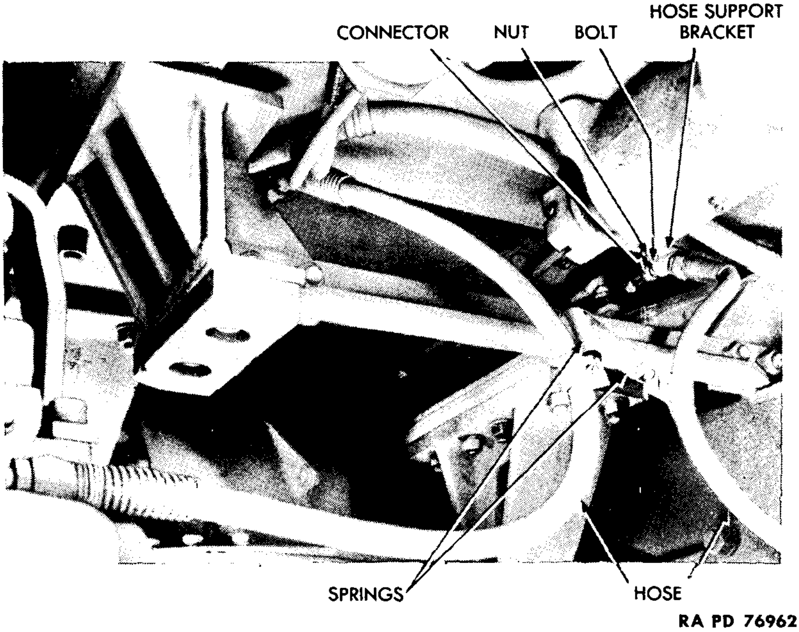


*Figure 207—Double Check Valve to Brake Cylinder Hose*

(2) INSTALL HUB AND SPROCKETS ASSEMBLIES. Lift hub and drive sprockets assembly into position over jackshaft tube. Install shim and wheel bearing adjusting nut. Adjust wheel bearings (par.

176) and install jackshaft bearing lock washer and lock nut, using wheel bearing nut wrench. Install jackshaft axle shaft (par. 148). Install the two drive chains (par. 146). Install remaining hub and sprockets assembly in the same manner.

## 150. TANDEM UNIT REMOVAL.

**a. Remove Transfer Case to Rear Axle Propeller Shaft.** Refer to paragraph 139.

**b. Disconnect Double Check Valve to Front Brake Cylinder Hose.** Disconnect each hose from connector at bottom and rear of bracket. Remove bolt, nut, and lock washer which secure hose support brackets to frame and disconnect each hose at its rear connector. Disconnect springs. Leave each hose connected to its brake cylinder and lower it out of way.

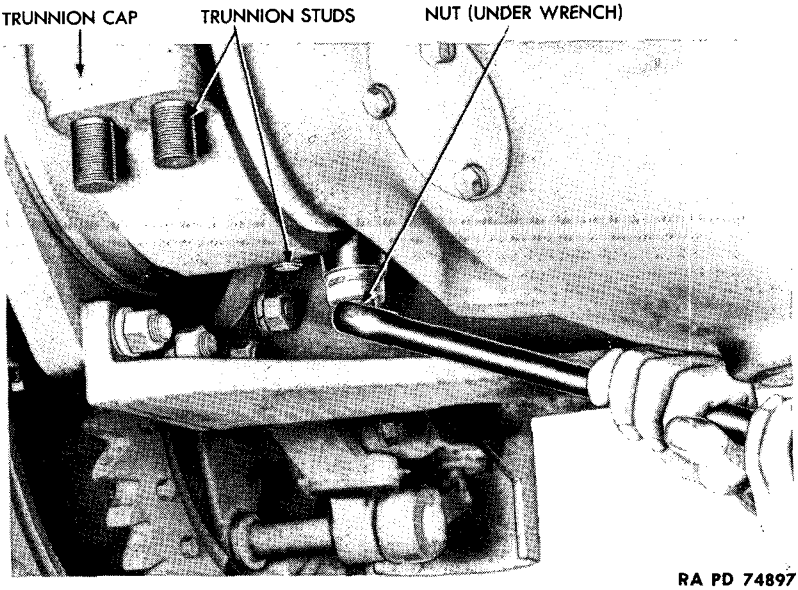
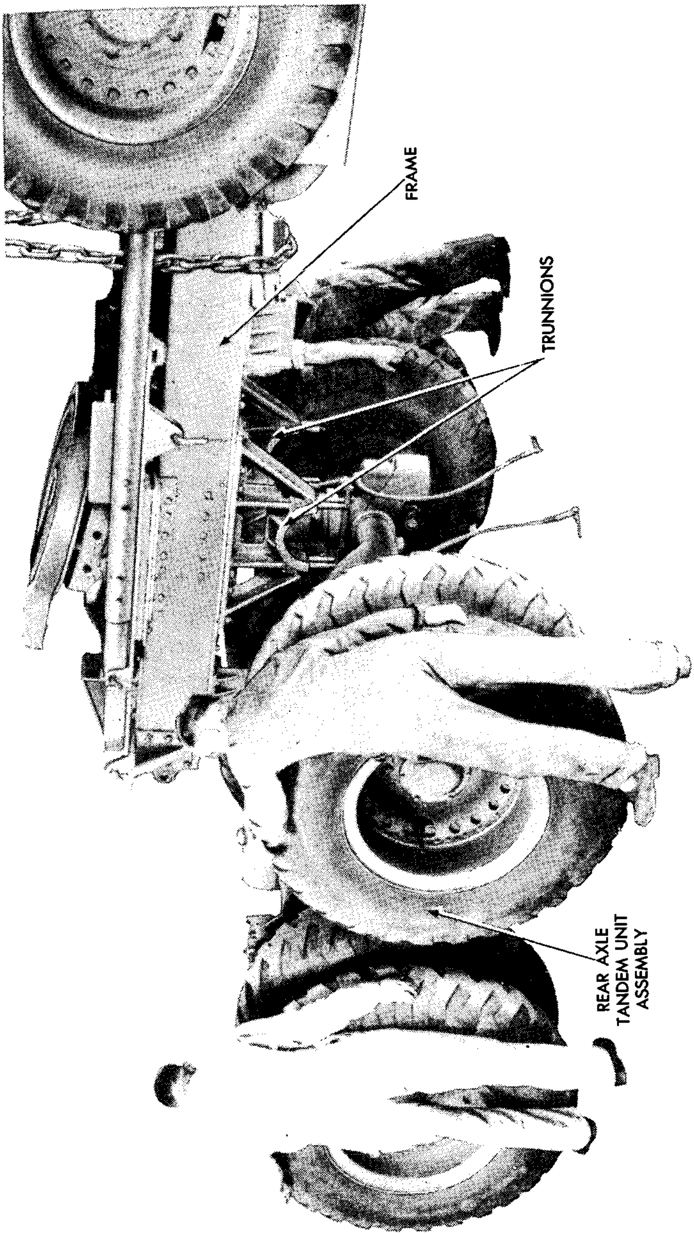


*Figure 208—Disconnecting Right-hand Jackshaft Trunnion Cap from Trunnion*

**c. Disconnect Drive Shaft Brake Rear Rod.** Remove cotter pin and clevis pin from yoke clevis at rear end of drive shaft brake rear rod and remove rod and yoke clevis from drive shaft brake long lever.

**d. Disconnect Double Check Valve to Rear Brake Cylinder Hose** (fig. 207). Disconnect each rear brake hose from connector at bottom and front of bracket. Then remove bolts, nuts, and lock washers which secure rear hose support brackets to frame. Disconnect springs and lower each hose out of way.


FRAME
TRUNNIONS
REAR AXLE TANDEM UNIT ASSEMBLY

RA PD 74923

Figure 209—Removal of Rear Axle Tandem Unit Assembly

**e. Disconnect Left-hand Jackshaft Trunnion from Differential Case.** Remove cotter pin, castellated nut, and bolt which secure trunnion to rear differential case at rear of trunnion.

**f. Disconnect Right- and Left-hand Jackshaft Trunnion Caps from Trunnion.** Remove four nuts and lock washers which secure right-hand trunnion cap to trunnion studs. Disconnect left-hand trunnion cap in the same manner.

**g. Remove Rear Axle Tandem Unit.** Block front wheels at front and rear of tires. Place a jack on wooden block at rear of vehicle under pintle. Jack up vehicle until trunnions are free of jackshaft trunnion caps and rear axle tandem unit is entirely free of vehicle. Block up unit with heavy wooden blocks and remove hydraulic jack and wooden block at extreme rear of vehicle. Roll rear axle tandem unit from under frame.

## 151. TANDEM UNIT INSTALLATION.

**a. Position Rear Axle Tandem Unit** (fig. 209). Position rear axle tandem unit assembly in direct line with rear of vehicle. Push assembly underneath rear end of vehicle, with jackshaft trunnion caps directly under studs of two trunnions on rear of frame.

**b. Lower Vehicle on Rear Axle Tandem Unit.** Remove wooden blocks at front of the rear axle tandem unit. Lower vehicle with jack until trunnion studs are entered through the jackshaft trunnion caps.

**c. Secure Jackshaft Trunnion Caps to Trunnions** (fig. 208). Install four nuts and lock washers which secure each trunnion cap to its mating trunnion. Then tap bolt which secures left-hand trunnion to rear differential case through differential case and install castellated nut and cotter pin on bolt.

**d. Connect Double Check Valve to Brake Cylinder Hose (rear)** (fig. 207). Lift right-hand hose into position with hose support bracket on frame and secure bracket to frame with two bolts, nuts, and lock washers. Install left-hand hose in same manner.

**e. Connect Drive Shaft Brake Rear Rod.** Lift yoke clevis at rear end of drive shaft brake rear rod into position on drive shaft brake long lever and secure it to lever with clevis pin and cotter pin.

**f. Connect Double Check Valve to Brake Cylinder Front Hose** (fig. 207). Lift left-hand hose support bracket in position on frame and secure bracket to frame with bolt, nut, and lock washer. In a similar manner, install right-hand hose.

**g. Install Transfer Case to Rear Axle Propeller Shaft.** See paragraph 140 c.

## Section XXIV

# SERVICE BRAKE SYSTEM

Paragraph
Description and data for system ........................ 152
Air compressor ........................ 153
Air reservoirs ........................ 154
Governor ........................ 155
Safety valve ........................ 156
Foot-operated brake valve ........................ 157
Hand-operated brake valves ........................ 158
Double check valves ........................ 159
Single check valve ........................ 160
Air supply valve ........................ 161
Brake cylinders ........................ 162
Slack adjusters ........................ 163
Stop light air switch ........................ 164
Low-pressure air indicator ........................ 165
Low-pressure air indicator buzzer ........................ 166
Air lines and hose ........................ 167
Semitrailer air connections ........................ 168
Air manifold ........................ 169
Relay valve ........................ 170
Service brake shoes ........................ 171

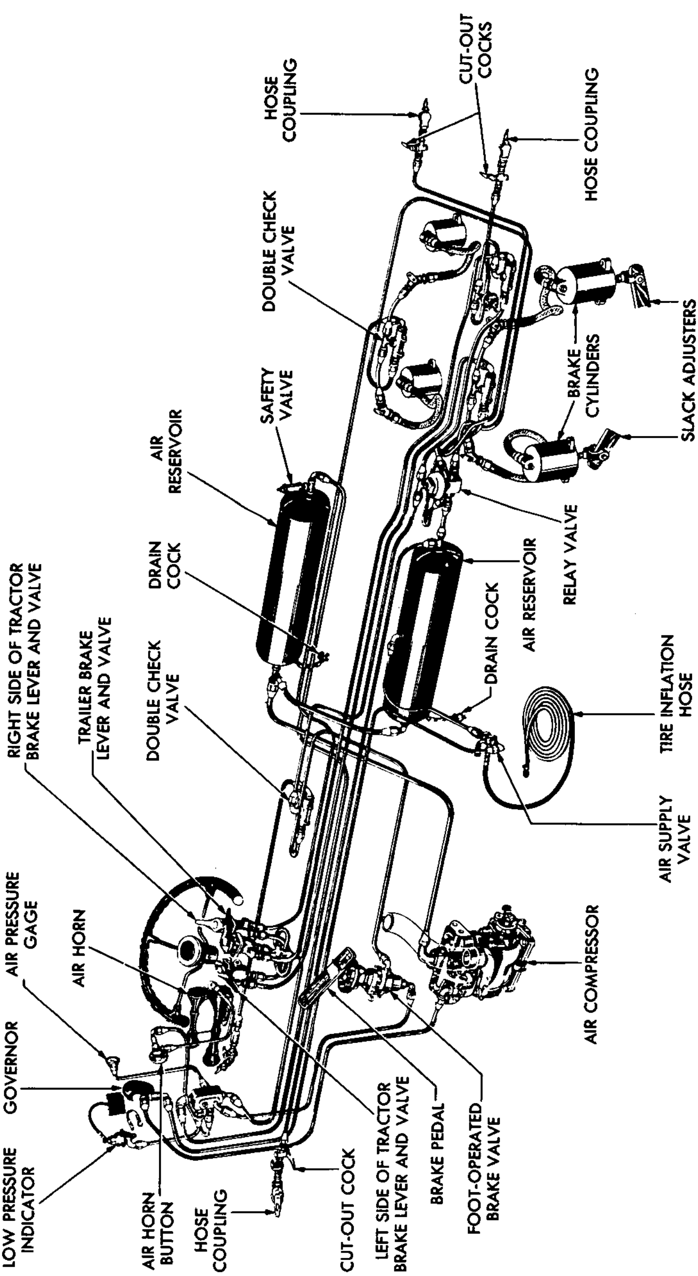
## 152. DESCRIPTION AND DATA FOR SYSTEM.

### a. Description and Operation.

(1) DESCRIPTION (fig. 210). The purpose of the compressed air brake equipment on the tractor is to operate the brakes on the four rear wheels of the tractor, also the brakes on the semitrailer. The air brake equipment also provides a source of compressed air supply for such uses as tire inflation and operating the air horn. The air brake system consists of an air compressor, two air reservoirs, a governor, three hand-operated valves, one foot-operated valve, an air pressure gage, air supply valve, relay valve, stop light air switch, low-pressure air indicator, and the necessary air lines and check valves to connect and control the units.

(2) OPERATION.

*(a) All Rear Wheel Brakes.* Pressure on the foot-operated brake valve allows compressed air to flow from the air reservoirs to the air manifold, then through double check valves to the brake cylinders, which actuate the slack adjusters and expand the brake shoes against the rear wheel brake drums. The brakes on the tractor and semitrailer rear wheels are applied by this valve which is located on the floor of the cab.


LOW PRESSURE INDICATOR
GOVERNOR
AIR PRESSURE GAGE
AIR HORN
RIGHT SIDE OF TRACTOR BRAKE LEVER AND VALVE
TRAILER BRAKE LEVER AND VALVE
AIR HORN BUTTON
DOUBLE CHECK VALVE
DRAIN COCK
AIR RESERVOIR
HOSE COUPLING
SAFETY VALVE
DOUBLE CHECK VALVE
HOSE COUPLING
CUT-OUT COCK
LEFT SIDE OF TRACTOR BRAKE LEVER AND VALVE
BRAKE PEDAL
FOOT-OPERATED BRAKE VALVE
CUT-OUT COCKS
DRAIN COCK
AIR RESERVOIR
RELAY VALVE
AIR COMPRESSOR
HOSE COUPLING
BRAKE CYLINDERS
AIR SUPPLY VALVE
TIRE INFLATION HOSE
SLACK ADJUSTERS

RA PD 77222

Figure 210—Air System, Schematic Drawing

(b) *Left Rear Wheel Brakes.* The hand-operated brake valve on the left side of the steering column operates the brakes on the left rear wheels of the tractor. Turning the lever of this valve to the right releases air pressure from the air reservoirs to the air manifold, then through a double check valve to the brake cylinders on the left rear wheels which actuates the left side slack adjusters and expands the brake shoes against brake drums on the left rear wheels.

(c) *Right Rear Wheel Brakes.* The hand-operated brake valve on the right side of the steering column operates the brakes on the right rear wheels of the tractor. The operation is the same as left rear wheel brakes.

(d) *Semitrailer Wheel Brakes.* The hand-operated brake valve in the center of the steering column operates the brakes on the semitrailer wheels. Details of operation of semitrailer wheel brakes are explained in Part Three of this manual.

**b. Data.**

| Unit | Make | Model |
|---|---|---|
| Air compressor | Bendix Westinghouse | 3UE12VW |
| Slack adjuster | Bendix Westinghouse | 220938 |
| Air horn | Bendix Westinghouse | 217869 |
| Low-pressure indicator | Bendix Westinghouse | 215186 |
| Air reservoir | Bendix Westinghouse | 221393 |
| Air manifold | Bendix Westinghouse | 212322 |
| Valves: | | |
| Air horn | Bendix Westinghouse | 217866 |
| Air supply | Bendix Westinghouse | 221192 |
| Foot-operated brake | Bendix Westinghouse | 216231 |
| Hand-operated brakes (on tractor) | Bendix Westinghouse | 221303 |
| Hand-operated brakes (for trailer) | Bendix Westinghouse | 215748 |
| Relay valve | Bendix Westinghouse | 217383 |
| Safety valve | Bendix Westinghouse | 215105 |
| Single check valve | Bendix Westinghouse | 220306 |

## 153. AIR COMPRESSOR.

**a. Description** (fig. 211). The air compressor is driven by the engine to furnish the compressed air necessary to operate the brake system. It is located on the left side of the engine and is a three-cylinder pump, water-cooled by the cooling system, and lubricated by the engine oiling system. The compressor is of the reciprocating single-acting type and runs continuously while the engine is running, but compresses air only when the governor is cut in.

**b. Maintenance and Adjustment.**

(1) MAINTENANCE. Check all air and water line connections and tighten if loose. Tighten flexible coupling nuts. Check clearance of unloader valves; it must be between 0.010 and 0.015 inch.

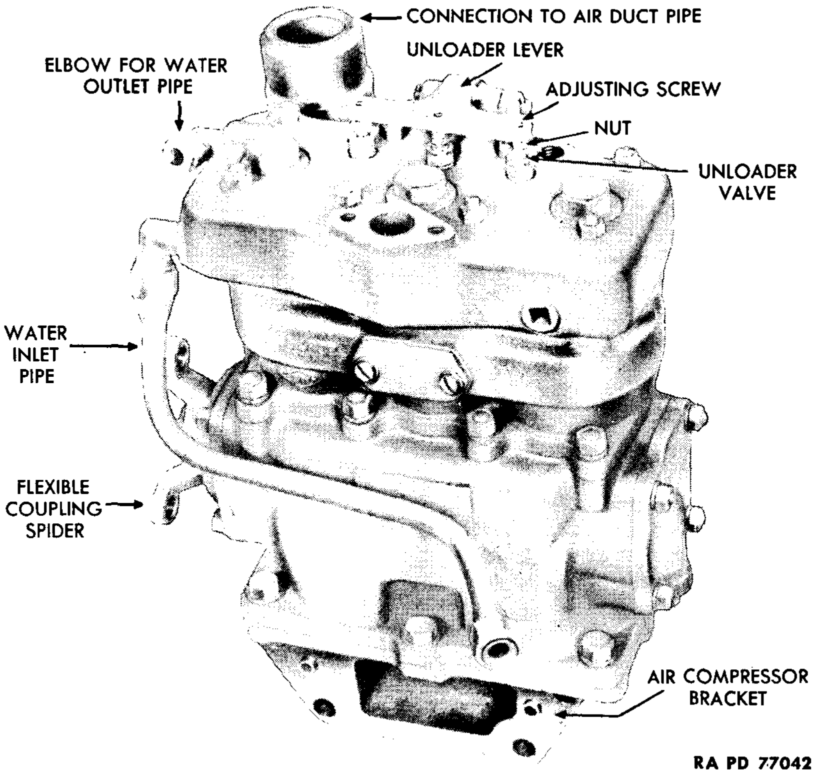

CONNECTION TO AIR DUCT PIPE
UNLOADER LEVER
ELBOW FOR WATER OUTLET PIPE
ADJUSTING SCREW
NUT
UNLOADER VALVE
WATER INLET PIPE
FLEXIBLE COUPLING SPIDER
AIR COMPRESSOR BRACKET
RA PD 77042

*Figure 211—Air Compressor*

(2) ADJUSTMENT. Loosen nut which secures each adjusting screw in position on unloader lever. Turn adjusting screw while holding a 0.012-inch feeler gage between square-head end of screw and unloader valve. When desired clearance is obtained, tighten nut while holding adjusting screw. Check clearance after tightening nut to be sure it is correct and has not changed during tightening operation.

c. **Removal.** Loosen hose clamps that hold air pipe to air duct and air compressor. Disconnect air lines to air governor and to air reservoir at air compressor. Unscrew three nuts and bolts which hold flexible coupling spider to flexible coupling thermoid disk. Disconnect water outlet pipe at air compressor and disconnect water inlet pipe at water pump. Push accessory shaft to the rear in order to obtain clearance. Remove four nuts and lock washers that hold air compressor bracket on upper crankcase. Remove air compressor with its bracket and water inlet pipe and then remove air compressor bracket gasket.

d. **Installation.** Install a new air compressor bracket gasket. Place air compressor with its bracket and water inlet pipe in posi-

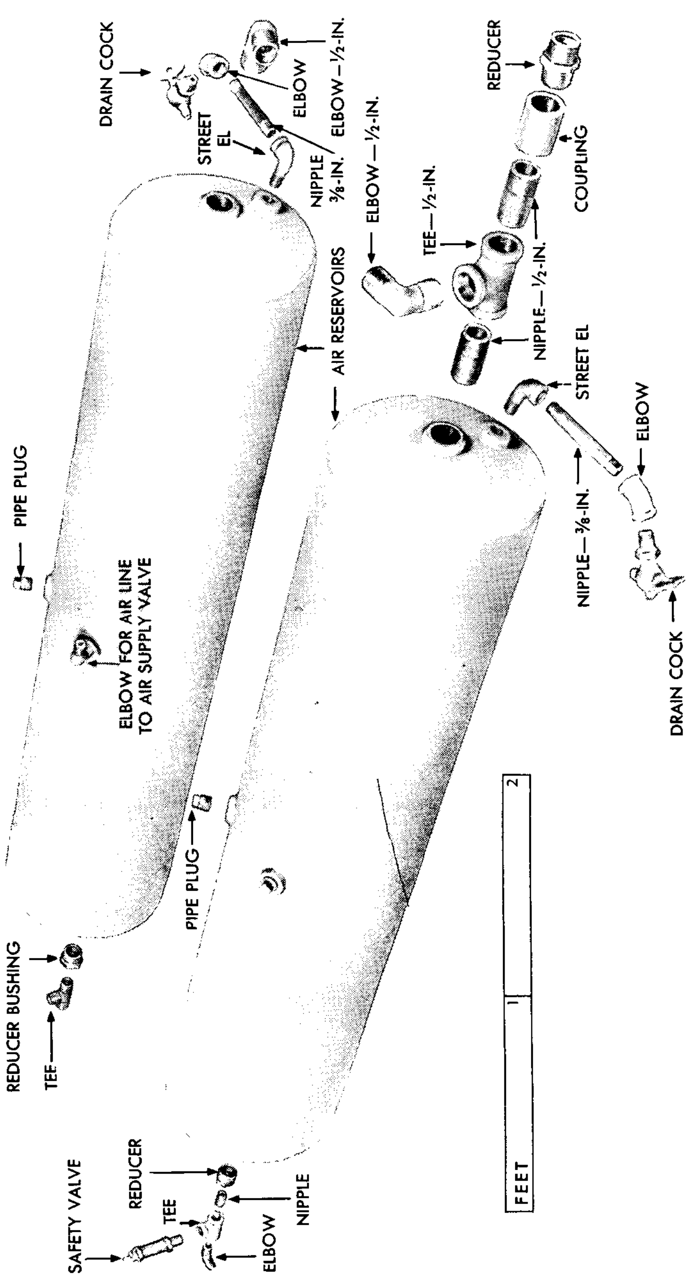

DRAIN COCK
STREET EL
ELBOW
ELBOW—½-IN.
NIPPLE ⅜-IN.
ELBOW—½-IN.
TEE—½-IN.
REDUCER
COUPLING
NIPPLE—½-IN.
AIR RESERVOIRS
STREET EL
ELBOW
NIPPLE—⅜-IN.
DRAIN COCK
PIPE PLUG
ELBOW FOR AIR LINE TO AIR SUPPLY VALVE
PIPE PLUG
REDUCER BUSHING
TEE
SAFETY VALVE
REDUCER
TEE
NIPPLE
ELBOW
FEET
1
2
RA PD 77043

Figure 212—Air Reservoirs and Fittings

tion and fasten to upper crankcase with four nuts and lock washers. Connect water outlet pipe at air compressor and connect water inlet pipe at water pump. Install three bolts and nuts that hold flexible coupling spider to flexible coupling thermoid disk. Connect air lines to air governor and to air reservoir. Install air pipe to air duct and tighten hose clamps.

## 154. AIR RESERVOIRS.

a. **Description** (fig. 212). There are two cylindrical air reservoirs in the air brake system. They are connected together by pipes and fittings and each is clamped to the vehicle frame by U-bolts. Each reservoir is equipped with a drain cock for the purpose of draining off accumulated moisture, and the right-hand reservoir has a safety valve to prevent damage if too much air pressure is built up due to failure of the governor.

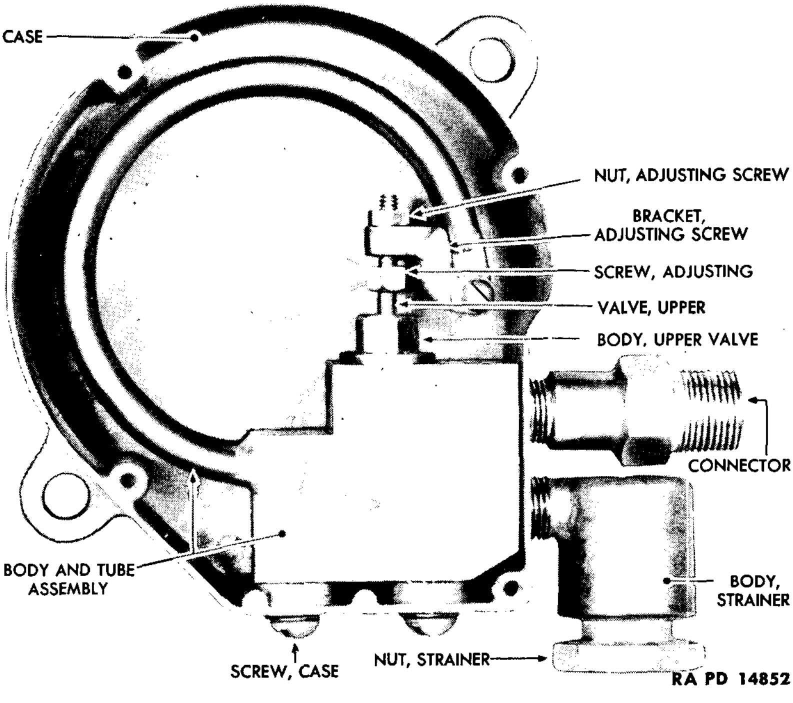

CASE
NUT, ADJUSTING SCREW
BRACKET, ADJUSTING SCREW
SCREW, ADJUSTING
VALVE, UPPER
BODY, UPPER VALVE
CONNECTOR
BODY AND TUBE ASSEMBLY
BODY, STRAINER
SCREW, CASE
NUT, STRAINER
RA PD 14852

*Figure 213—Interior of Governor*

b. **Maintenance.** Open drain cocks and drain water from reservoirs. Check operation of safety valves; they must pop open at 100 pounds pressure.

c. **Removal.** Loosen four bolts that hold plate over air reservoirs and remove plate. Disconnect air lines (fig. 210). Remove clamp bolts, nuts, and lock washers, then spread clamps and remove reservoirs.

**d. Installation.** Install reservoir in clamp and fasten with bolt, nut, and lock washer. Connect air lines (fig. 210). Install plate over air reservoirs and secure with four bolts.

## 155. GOVERNOR.

**a. Description.** The governor is located on the left side of the vehicle inside the radiator door and is the means of limiting the amount of air pressure which the air compressor produces. When the pressure in the air reservoirs reaches 100 to 105 pounds, the governor causes the compressor unloader valves to open, stopping further compression. When the minimum pressure is reached in the air reservoirs (85 lb), the governor closes the compressor unloader valves and permits compression to start.

**b. Adjustment** (fig. 213). If air pressure range (85 to 105 lb) is incorrect, it is necessary to remove shims from underneath valve guide and higher authority must be notified. However, if pressure is within this range, the pressure setting may be raised or lowered by holding adjusting screw and loosening adjusting screw nut. Adjust pressure by turning adjusting screw; to raise the set pressure, turn adjusting screw clockwise; to lower the set pressure, turn adjusting screw counterclockwise. Tighten adjusting screw nut while holding adjusting screw.

**c. Removal.** Disconnect the two air lines at governor. Remove two bolts, nuts, and lock washers that hold governor to dash and lift it off.

**d. Installation.** Install governor on dash and fasten with two bolts, nuts, and lock washers. Connect the two air lines to governor.

## 156. SAFETY VALVE.

**a. Description.** The safety valve is located on top of the right air reservoir and protects the air system against building up excessive reservoir pressures. Air pressure in excess of 150 pounds is allowed to escape.

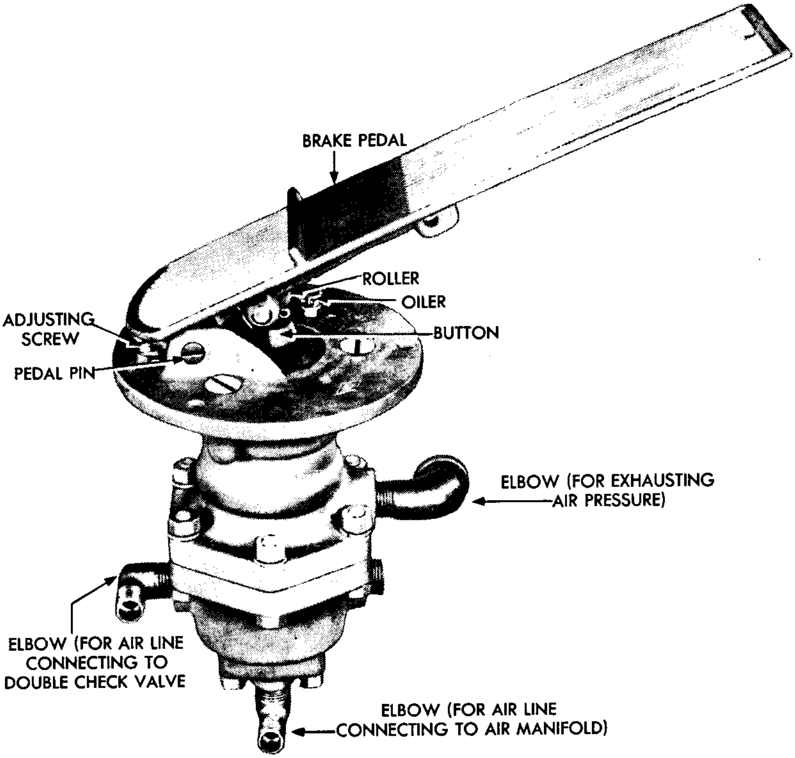
**b. Maintenance.** Loosen lock nut and adjust the set pressure by turning adjusting nut. Turn nut clockwise to increase set pressure or counterclockwise to decrease. Tighten lock nut.

**c. Removal.** Remove valve from tee on right air reservoir.

**d. Installation.** Install valve in tee on right air reservoir.

## 157. FOOT-OPERATED BRAKE VALVE.

**a. Description** (fig. 214). The brake pedal on the foot-operated brake valve controls the brakes on the rear wheels of the tractor and also on the semitrailer, and is located on the cab floor at the driver's seat.


BRAKE PEDAL
ROLLER
OILER
ADJUSTING SCREW
BUTTON
PEDAL PIN
ELBOW (FOR EXHAUSTING AIR PRESSURE)
ELBOW (FOR AIR LINE CONNECTING TO DOUBLE CHECK VALVE
ELBOW (FOR AIR LINE CONNECTING TO AIR MANIFOLD)

RA PD 76996

*Figure 214—Foot-operated Brake Valve Assembly*

**b. Maintenance.** Remove pedal pin and brake pedal. Release brake pedal and measure distance between roller and button which must be $\frac{1}{16}$ inch and if it is not, adjust free travel of pedal. Loosen lock nut and turn adjusting screw counterclockwise to decrease, and clockwise to increase, pedal travel. Tighten lock nut.

**c. Removal.** Disconnect two air lines at valve (fig. 210). Remove three bolts, nuts, and lock washers that hold valve to floorboard and remove valve.

**d. Installation.** Install valve assembly on floorboard and fasten with three bolts, nuts, and lock washers. Connect air lines (fig. 210).

## 158. HAND-OPERATED BRAKE VALVES.

**a. Description.** The three hand-operated brake valves operate the brakes on right side of tractor, left side of tractor, and on semitrailer only. These valves are secured to the steering column below the steering wheel.

**b. Removal.** Remove bolts, nuts, and lock washers that hold valves to steering column. Disconnect inlet and outlet air lines at each valve (fig. 210) and remove valves.

**c. Installation.** Install valves on steering column and secure them with bolts, nuts, and lock washers that hold valves to steering column. Connect inlet and outlet air lines to each valve (fig. 210).

## 159. DOUBLE CHECK VALVES.

**a. Description.** Four double check valves are used to prevent loss of air pressure through an open exhaust of the brake valves which are not being operated. These valves are secured to the chassis frame (fig. 210).

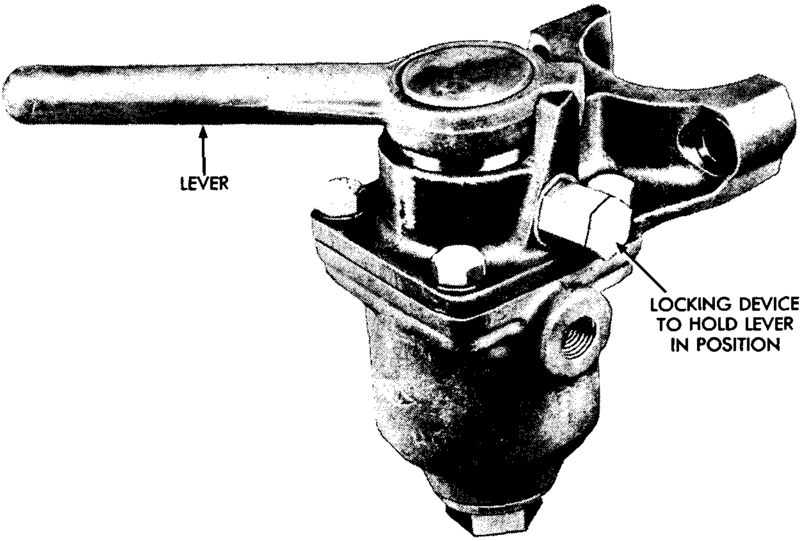


*Figure 215—Hand-operated Brake Valve*

**b. Removal.** Disconnect air lines from fittings (fig. 210). Remove bolt, nut, and lock washer that hold valve to frame and lift off valve.

**c. Installation.** Install valve on frame and fasten with bolt, nut, and lock washer. Connect air lines to inlet and outlet fittings on valve (fig. 210).

## 160. SINGLE CHECK VALVE.

**a. Description.** The single check valve protects the air system from air loss in case the emergency line cut-out cock is left open.

**b. Removal.** Disconnect inlet and outlet air lines from valve fittings (fig. 210). Remove bolt, nut, and lock washer that hold valve to frame, and lift off valve.

**c. Installation.** Install valve on frame and fasten with bolt, nut, and lock washer. Connect inlet and outlet air lines to valve fittings.

## 161. AIR SUPPLY VALVE.

**a. Description.** The air supply valve is in the left side tool box in the air line between the left reservoir and the governor. It is used to furnish air supply for inflating tires or any other purpose desired.

**b. Removal.** Disconnect inlet and outlet air lines from valve fittings (fig. 210). Remove two bolts, nuts, and lock washers that hold valve to tool box and lift out valve.

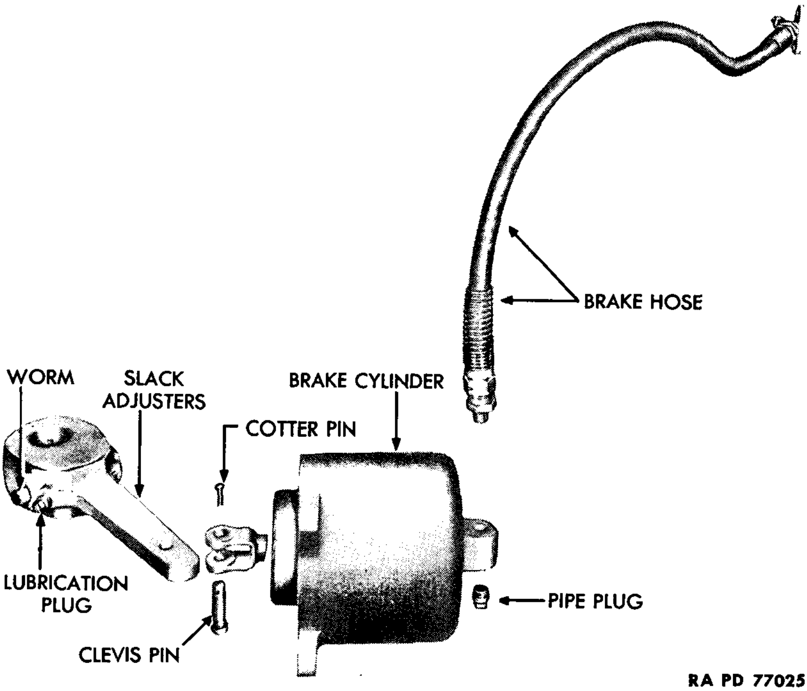


*Figure 216—Brake Cylinder, Slack Adjuster, and Connections*

**c. Installation.** Install valve in tool box and fasten with two bolts, nuts, and lock washers. Connect inlet and outlet air lines to valve fittings (fig. 210).

## 162. BRAKE CYLINDERS.

**a. Description.** The four brake cylinders are located on the rear axle tandem unit. They are used to operate the brakes on the rear wheels. The cylinders convert the energy of compressed air into the mechanical force necessary to operate the slack adjusters and brake shoes.

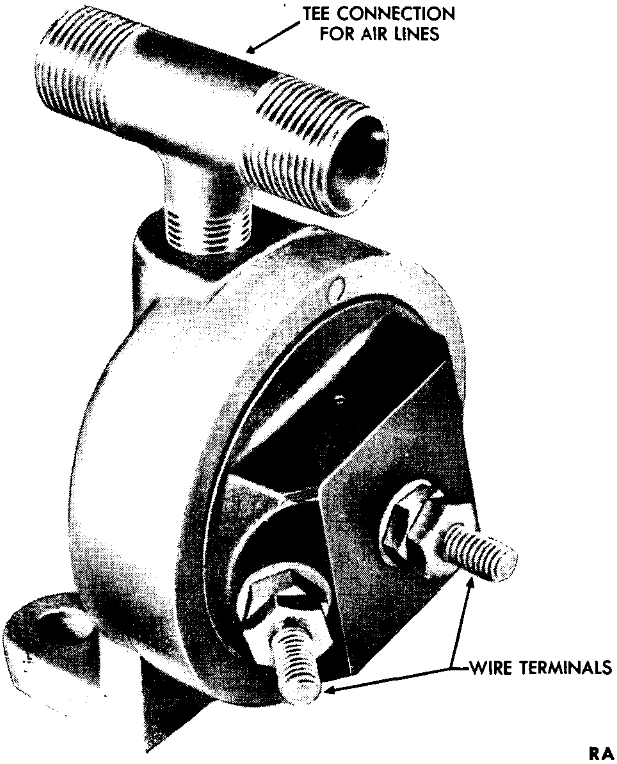


*Figure 217—Stop Light Switch*

**b. Maintenance.** The travel of the brake cylinder push rods should be kept at a minimum without the brakes dragging. Raise the wheel of brake to be adjusted off ground. Turn the adjusting screw of slack adjuster until the brake cylinder push rod travel is as short as possible with no perceptible drag on the brake when the wheel is turned.

## 163. SLACK ADJUSTERS.

**a. Description.** A slack adjuster is a part of each brake assembly and is the means of adjusting brakes to compensate for brake lining wear.

**b. Adjustment.** Build up air pressure to at least 80 pounds and maintain at least 60 pounds during brake adjustment. Adjust brakes (par. 171).

**c. Removal.** Disconnect slack adjuster by removing cotter pin and clevis pin, then remove screw and two washers that hold adjuster to brake camshaft. Remove adjuster from camshaft.

**d. Installation.** Install adjuster on brake camshaft and fasten with screw and two washers. Connect adjuster to brake cylinder with clevis pin and cotter pin.

## 164. STOP LIGHT AIR SWITCH.

**a. Description.** The stop light air switch controls the operation of the stop lights and is located at the rear of the chassis frame.

**b. Removal.** Disconnect two wires from terminal on switch, then disconnect two air lines from tee fitting on switch (fig. 210). Remove two bolts, nuts, and lock washers that hold switch to frame and remove switch.

**c. Installation.** Install switch on frame and fasten with two bolts, nuts, and lock washers. Connect the two air lines to the connection on switch and then connect two electric wires to switch terminals.

## 165. LOW-PRESSURE AIR INDICATOR.

**a. Description.** The low-pressure air indicator operates the low-pressure buzzer to warn the driver that air pressure has fallen below the safe operating point of 60 pounds.

**b. Removal.** Disconnect air line from fittings (fig. 210). Remove two nuts and lock washers that hold wires to indicator. Remove two bolts, nuts, and lock washers that hold indicator to dash and remove indicator.

**c. Installation.** Install indicator on dash and fasten with two bolts, nuts, and lock washers. Install two electric wires and fasten with two nuts and lock washers. Connect air line to indicator inlet fitting.

## 166. LOW-PRESSURE AIR INDICATOR BUZZER.

**a. Description.** The low-pressure air indicator buzzer is the means of signaling the driver that the air pressure has fallen below the safe point of 60 pounds. It is operated electrically by the low-pressure air indicator and is located on the front side of the dash.

**b. Removal.** Loosen cross recessed screw which holds cover to low-pressure air indicator buzzer and remove cover. Remove cover screw nut, insulation washer, and cover screw from cover. Then remove cover gasket. Remove two terminal screw nuts, lock washers, and plain washers from low-pressure air indicator buzzer terminals. Lift off two wires; one wire leads to low-pressure indicator and the other wire leads to fuse block. Remove two bolts, nuts, plain washers, and lock washers which hold low-pressure air indicator buzzer to dash and lift buzzer off dash.

**c. Installation.** Install buzzer on dash and fasten with two bolts, nuts, plain washers, and lock washers. Install two wires on buzzer terminals (fig. 210) and fasten with two terminal screw nuts, plain washers, and lock washers. Install cover gasket, then install the cover screw nut, insulation washer, and cover screw. Install cover and tighten cover screw.

RA PD 76947

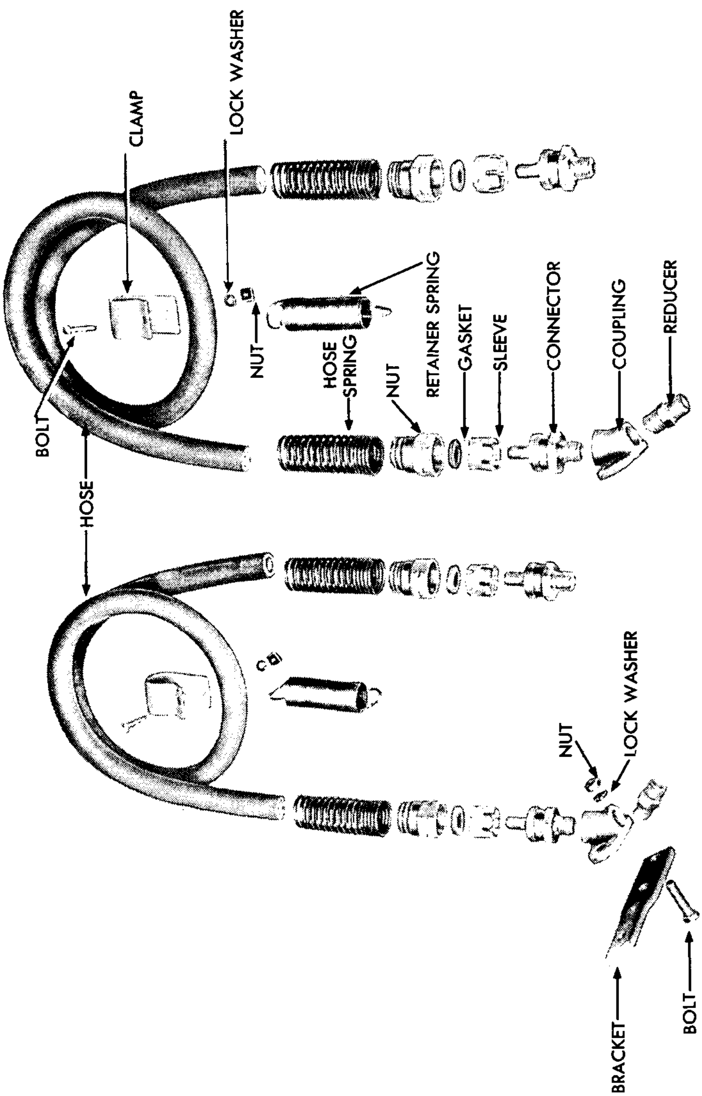

CLAMP
LOCK WASHER
BOLT
HOSE
NUT
HOSE SPRING
NUT
RETAINER SPRING
GASKET
SLEEVE
CONNECTOR
COUPLING
REDUCER
NUT
LOCK WASHER
FRAME BRACKET
BOLT

*Figure 218—Air Hose and Fittings*

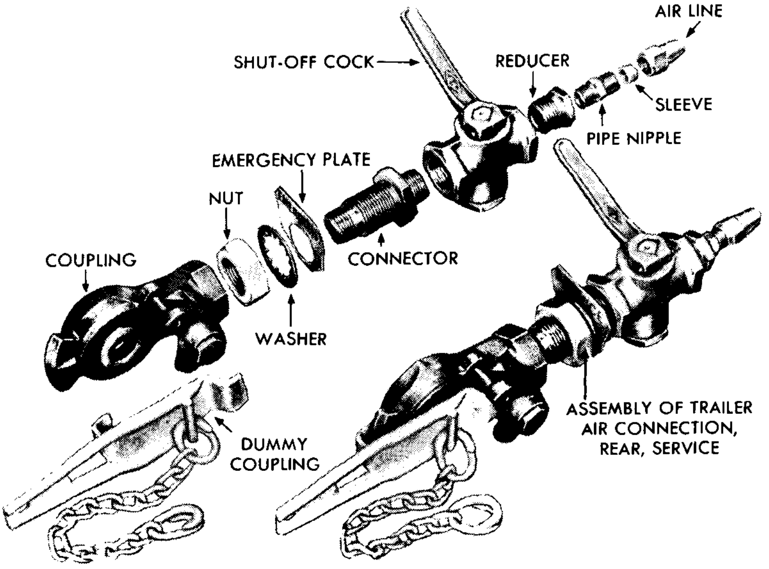
## 167. AIR LINES AND HOSE.

**a. Description.** The air lines and hose are used to carry the compressed air to the air units. The hose is used where movement of the vehicle might cause breakage of a metal air line.

**b. Maintenance.**

(1) FITTING AIR LINES (fig. 218). New pipes must be cut at a right angle to the outside wall of pipe. Slide nut and sleeve on pipe. Insert pipe all the way into body. Hold pipe in body and tighten nut until it is snug.

(2) FITTING AIR HOSE. Cut hose at right angle to outside wall of hose. Slide spring and nut on hose, then install sleeve about one inch from end of hose. Place gasket over end of hose guide in connector. Remove protector from face of gasket. Install hose in connector. Slide sleeve against edge of connector and tighten nut until it is snug.


AIR LINE
SHUT-OFF COCK
REDUCER
SLEEVE
PIPE NIPPLE
EMERGENCY PLATE
NUT
CONNECTOR
COUPLING
WASHER
DUMMY COUPLING
ASSEMBLY OF TRAILER AIR CONNECTION, REAR, SERVICE

RA PD 77052

*Figure 219—Semitrailer Air Connections—Rear*

## 168. SEMITRAILER AIR CONNECTIONS.

**a. Description** (figs. 219 and 220). The service and emergency air connections are located at the front and at the rear of the tractor. They are used to connect the tractor to the semitrailer at the rear and, in case of a breakdown, to another vehicle at the front. Each connection contains a shut-off valve and a coupling which secures the connecting hose.

**b. Removal of Front Service Connection.** Remove connection parts in the following order: dummy coupling, coupling, pipe nipple, elbow, connector, service plate, washer, coupling nut, and pipe nipple (fig. 220).

**c. Installation of Front Service Connection** (fig. 220). Install pipe nipple, washer, coupling nut, service plate, connector, elbow, pipe nipple, coupling, and dummy coupling. Tighten fittings securely.

**d. Removal of Front Emergency Connection.** Remove connection parts in the following order: dummy coupling, coupling, pipe nipple, elbow, connector, emergency plate, connector washer, coupling nut, shut-off cock, reducer, pipe nipple, check valve, and pipe nipple (fig. 220).

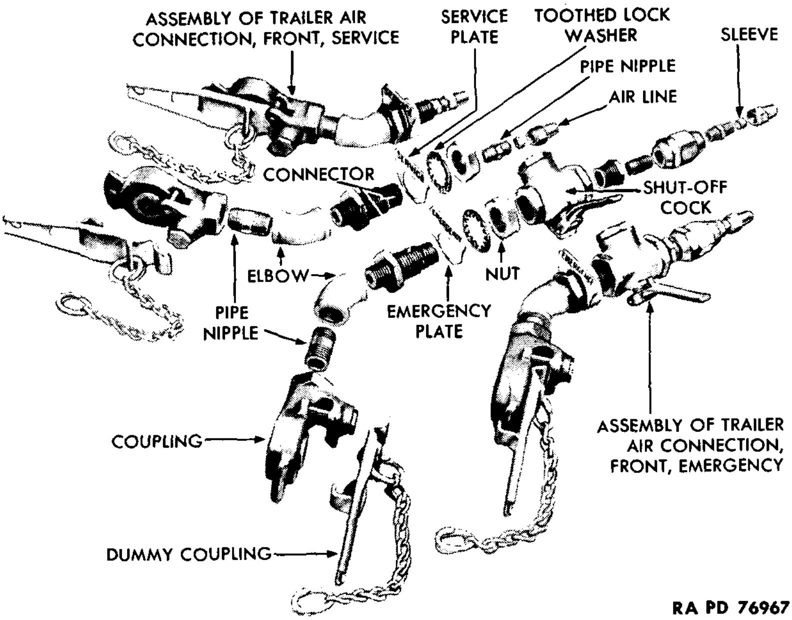
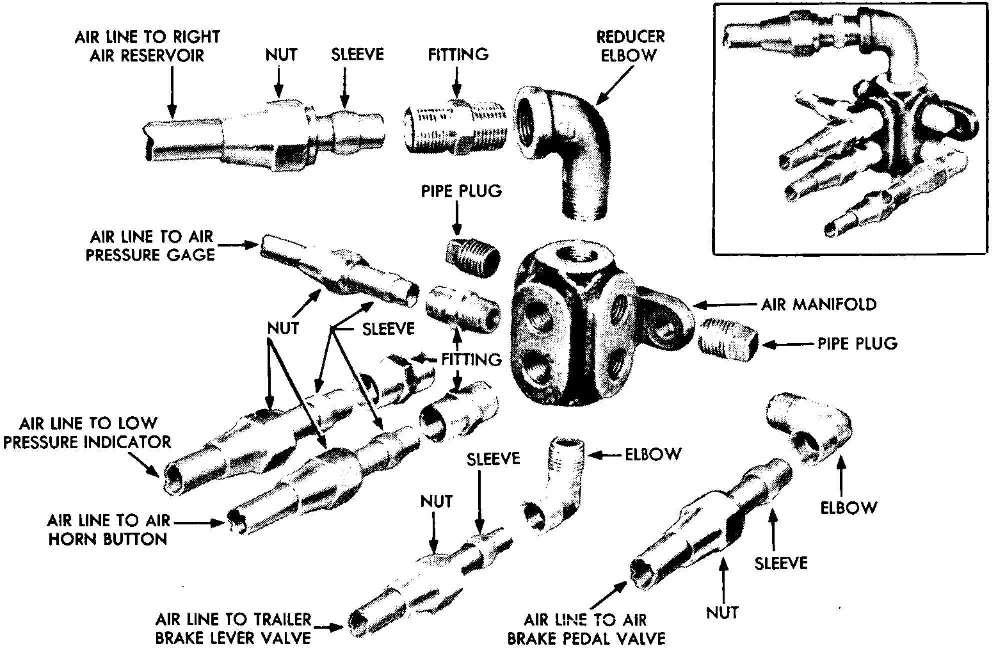

ASSEMBLY OF TRAILER AIR CONNECTION, FRONT, SERVICE
SERVICE PLATE
TOOTHED LOCK WASHER
SLEEVE
PIPE NIPPLE
AIR LINE
CONNECTOR
SHUT-OFF COCK
ELBOW
NUT
PIPE NIPPLE
EMERGENCY PLATE
COUPLING
ASSEMBLY OF TRAILER AIR CONNECTION, FRONT, EMERGENCY
DUMMY COUPLING
RA PD 76967

*Figure 220—Semitrailer Air Connections—Front*

**e. Installation of Front Emergency Connection** (fig. 220). Install pipe nipple, check valve, pipe nipple, reducer, shut-off cock, coupling nut, connector washer, emergency plate, connector, elbow, pipe nipple, coupling, and dummy coupling. Tighten all fittings securely.

**f. Removal of Rear Service or Emergency Connections** (fig. 219). Remove parts in the following order: dummy coupling, coupling, connector, service or emergency plate, connector washer, coupling nut, shut-off cock, reducer, and pipe nipple.


AIR LINE TO RIGHT AIR RESERVOIR
NUT
SLEEVE
FITTING
REDUCER ELBOW
PIPE PLUG
AIR LINE TO AIR PRESSURE GAGE
NUT
SLEEVE
FITTING
AIR MANIFOLD
PIPE PLUG
AIR LINE TO LOW PRESSURE INDICATOR
SLEEVE
ELBOW
AIR LINE TO AIR HORN BUTTON
NUT
ELBOW
SLEEVE
NUT
AIR LINE TO TRAILER BRAKE LEVER VALVE
AIR LINE TO AIR BRAKE PEDAL VALVE

RA PD 77053

RA PD 77053

Figure 221—Air Manifold, Showing Air Lines

**g. Installation of Rear Service or Emergency Connections** (fig. 219). Install pipe nipple, reducer, shut-off cock, coupling nut, connector washer, service or emergency plate, connector, coupling, dummy coupling. Tighten fittings securely.

## 169. AIR MANIFOLD.

**a. Description.** The air manifold acts as a junction box for distribution of the compressed air to the various air units. The manifold is attached to the dash and is reached through the radiator door.

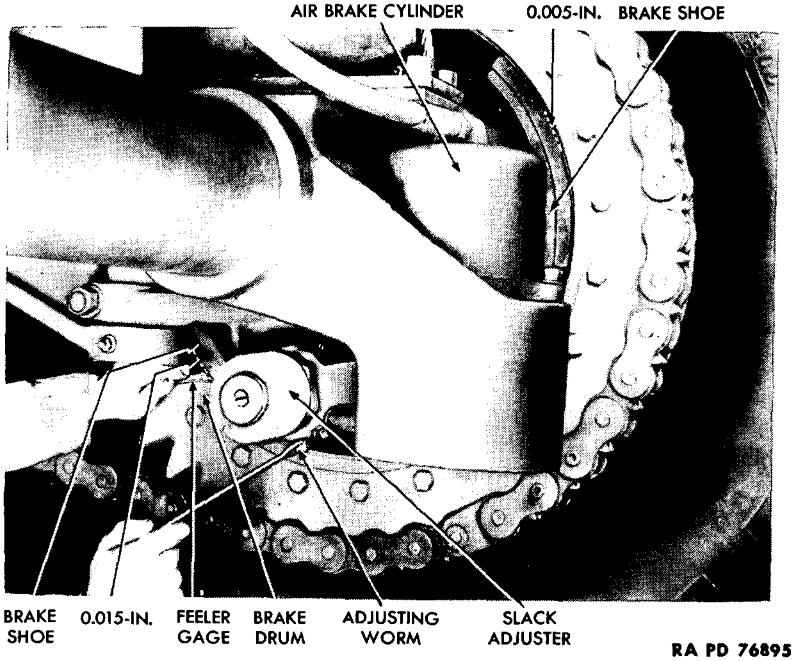


*Figure 222—Adjustment of Service Brakes*

**b. Removal.** Disconnect six air lines from inlet and outlet fittings. Remove two bolts, nuts, and lock washers that hold manifold to dash and lift off manifold.

**c. Installation.** Install manifold on dash and fasten with two bolts, nuts, and lock washers. Connect six air lines to manifold inlet and outlet fittings.

## 170. RELAY VALVE.

**a. Description.** The relay valve is located on the chassis frame at the rear of the left reservoir. This valve is connected by air lines to the foot-operated brake valve and wheel cylinders. It is operated by the foot valve to speed up application and release of wheel brakes.

**b. Removal.** Disconnect six air lines from inlet and outlet fittings on valve. Remove two bolts, nuts, and lock washers that hold valve to frame and lift off valve.

**c. Installation.** Install valve on frame and fasten with two bolts, nuts, and lock washers. Connect the six air lines to the valve inlet and outlet fittings.

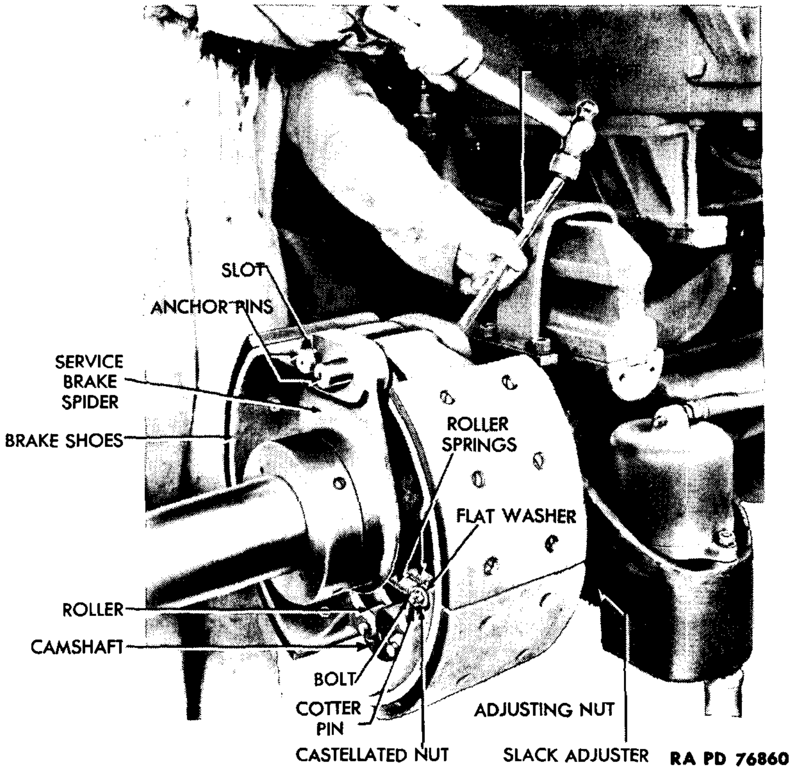

SLOT
ANCHOR PINS
SERVICE BRAKE SPIDER
BRAKE SHOES
ROLLER SPRINGS
FLAT WASHER
ROLLER
CAMSHAFT
BOLT
COTTER PIN
ADJUSTING NUT
CASTELLATED NUT
SLACK ADJUSTER
RA PD 76860

*Figure 223—Removal of Service Brake Shoes*

## 171. SERVICE BRAKE SHOES.

**a. Description** (fig. 222). There are four brake shoe assemblies in the rear axle tandem unit assembly, one for each of the four stationary axle hub and drum assemblies. Each brake shoe assembly is secured to the top of a brake spider by means of two brake shoe anchor pins, one pin securing each brake shoe to the spider. Brake drums are installed over the brake shoes and the brake shoes are expanded against the service brake drums by means of the service brake cam which operates against the brake shoe rollers. The cam is rotated by the slack adjuster which is secured to the camshaft. The lower ends of the brake shoes of each brake shoe assembly are held together by two service brake roller springs, which are secured to the shoes by means of two bolts, four flat washers, and two castellated nuts and cotter pins.

**b. Adjustment** (fig. 222). Adjustment is made by means of the adjusting worm on the bottom of each air brake slack adjuster. Tighten or loosen the service brake shoes until the clearance, measured with a feeler gage between the lining and brake drum, is 0.005 inch at the toe (top) and 0.015 inch at the heel (bottom) of each shoe. Turn the slack adjuster adjusting worm clockwise to tighten shoes against the drum, and counterclockwise to loosen them.

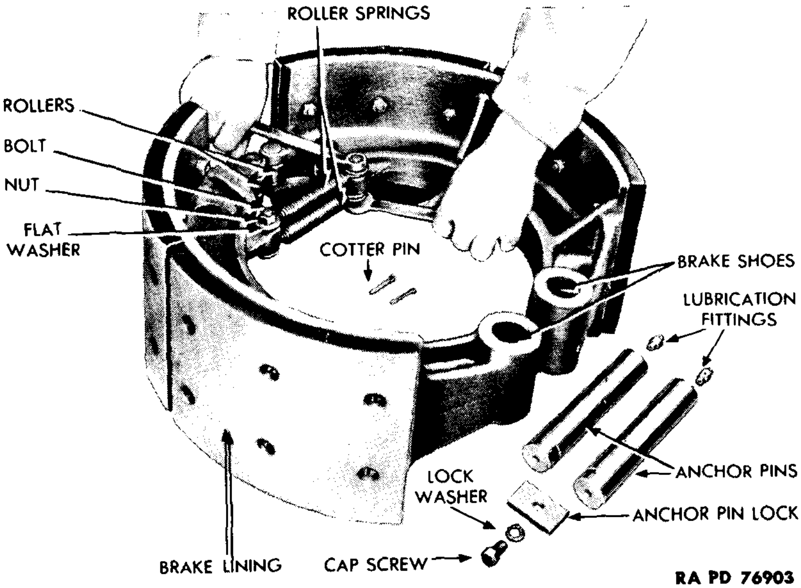

ROLLER SPRINGS
ROLLERS
BOLT
NUT
FLAT WASHER
COTTER PIN
BRAKE SHOES
LUBRICATION FITTINGS
ANCHOR PINS
ANCHOR PIN LOCK
LOCK WASHER
CAP SCREW
BRAKE LINING
RA PD 76903

*Figure 224—Removal of Service Brake Roller Springs*

**c. Removal** (figs. 223 and 224).

(1) REMOVE HUB AND DRUM. Remove the wheels from hub and drum from which the brake shoes are to be removed, following the procedure given in paragraph 175. Then remove the hub and drum assembly, following the procedure given in paragraph 176.

(2) REMOVE BRAKE SHOE ASSEMBLY. Remove the cap screw and lock washers which secure the anchor pin lock to the brake spider. Then use a hammer and brass drift to drive out anchor pin, using caution not to damage the lubrication fitting. Do not remove the lubrication fitting, since the punch may damage fitting opening in the pin. Then lower one brake shoe and drive out the other anchor pin and lift off the brake shoe assembly.

(3) SEPARATE BRAKE SHOES. Remove the two bolts, castellated nuts and cotter pins, and four flat washers which secure the ends of the two roller springs to the two brake shoes at the bottom. Remove the other brake shoes in the same way.

**d. Installation** (figs. 223 and 224).

(1) INSTALL ROLLER SPRINGS. Loosen the brake adjusting worm on the slack adjuster as much as possible. Then secure the two brake shoes together at the bottom by means of the two roller springs, installing a bolt through each shoe and one end of each spring. Secure each bolt to spring and shoe with two flat washers, a castellated nut, and cotter pin.

(2) INSTALL BRAKE SHOE ASSEMBLY. Lift the brake shoe assembly into position on the brake spider and use a hammer and brass drift to drive the two anchor pins through the tops of the shoes and the brake spider. Install the anchor pin lock in the slots in the outer ends of the two anchor pins and secure lock to spider with a cap screw and lock washer.

(3) INSTALL HUB AND DRUM ASSEMBLY AND WHEELS. Install the hub and drum assembly (par. 176) and install wheels (par. 175). Adjust the brake shoes (subpar. **b** above).

## Section XXV

# FROPELLER SHAFT BRAKE AND LINKAGE

Paragraph
Description and data ........................................ 172
Shoes and drum ........................................ 173
Levers and linkage ........................................ 174

## 172. DESCRIPTION AND DATA.

**a. Description.** The propeller shaft brake lever, located in the cab at the left of the driver, operates brake shoes which press against a propeller shaft brake drum. The drum is bolted between two universal joint companion flanges located at the rear of the transfer case. The brake lever and the clutch pedal use a cross linkage which is built in one unit. The rod which operates the brake extends from the brake and clutch cross linkage to the brake shoe actuating cam.

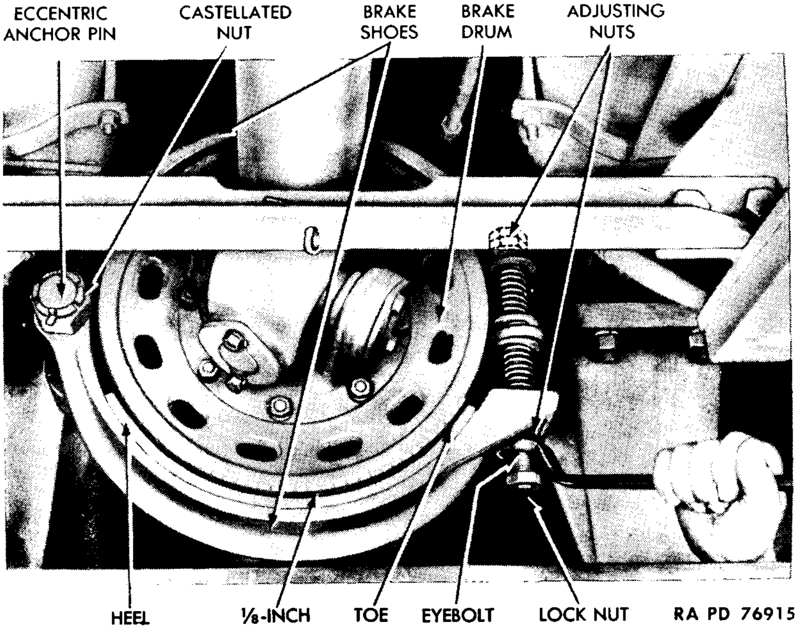

ECCENTRIC ANCHOR PIN
CASTELLATED NUT
BRAKE SHOES
BRAKE DRUM
ADJUSTING NUTS
HEEL
⅛-INCH
TOE
EYEBOLT
LOCK NUT
RA PD 76915

*Figure 225—Adjustment of Drive Shaft Brake Shoes*

**b. Data.**

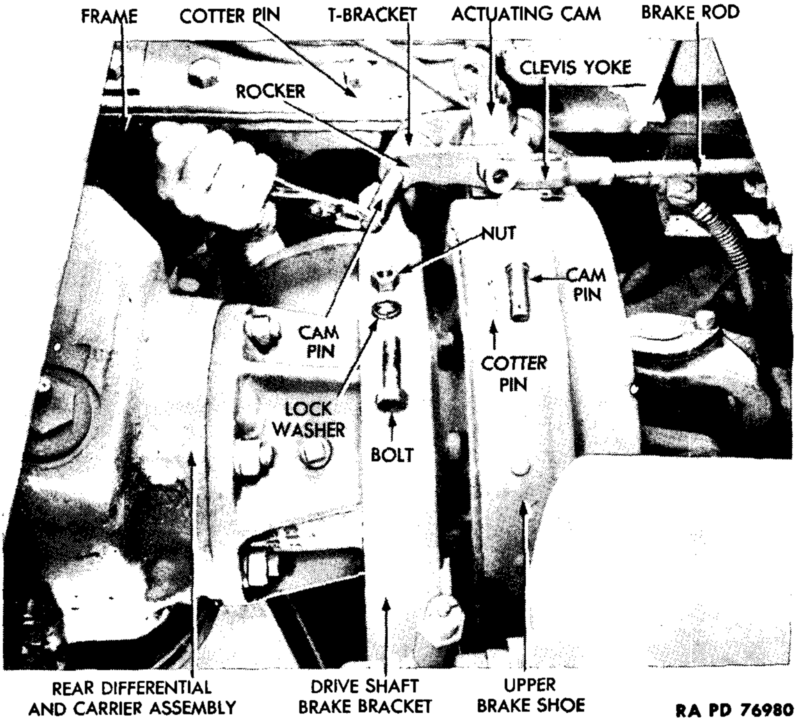
| | |
|---|---|
| Make | Vulcan-Cochin |
| Model | A-FT 4712 |
| Type | two-shoe |

## 173. SHOES AND DRUM.

### a. Adjustment of Shoes (fig. 225).

(1) GENERAL. Adjustment procedure for parking brake linkage is given in paragraph 79. Clearance between drive shaft brake shoes and the brake drum should be ⅛ inch. Brake shoes are adjusted by means of an eccentric anchor pin for heel adjustment and by means of the eyebolt for toe adjustment.

(2) ADJUST BRAKE SHOES. Remove the rear cotter pin and castellated nut and turn the forward castellated nut, which is locked to the anchor pin with a cotter pin, until ⅛-inch clearance at the heel of the brake shoes is attained. Then remove the lower lock nut on the eyebolt and adjust the top and lower adjusting nuts until ⅛-inch clearance is attained at toe of shoes.


FRAME
COTTER PIN
T-BRACKET
ACTUATING CAM
BRAKE ROD
CLEVIS YOKE
ROCKER
NUT
CAM PIN
CAM PIN
COTTER PIN
LOCK WASHER
BOLT
REAR DIFFERENTIAL AND CARRIER ASSEMBLY
DRIVE SHAFT BRAKE BRACKET
UPPER BRAKE SHOE

RA PD 76980

*Figure 226—Disconnecting Drive Shaft Brake Rocker from T-bracket*

### b. Removal of Brake Shoes (fig. 227).

(1) REMOVE DUMMY COUPLING PLATE AND CAM PIN. Remove dummy coupling plate by loosening four cap screws until clips which secure plate to frame can be turned and lift plate from frame. From

underneath vehicle, remove cotter pin and cam pin which secure clevis yoke at rear end of brake rod to actuating cam.

(2) REMOVE ROCKER FROM T-BRACKET. Remove two bolts, nuts, and lock washers which secure T-bracket to the propeller shaft brake bracket. Turn T-bracket, rocker, and cam toward left side of frame and remove cam pin and cotter pin which secure rocker to T-bracket (fig. 208).

(3) REMOVE T-BRACKET. Remove lock nut, adjusting nut, and pad from bottom of eyebolt (fig. 209). Drop lower brake shoe and remove lower eyebolt spring, linkage rocker washers and T-bracket from eyebolt.

(4) REMOVE BRAKE SHOES. Next remove cotter pin and castellated nut from front end of anchor pin and remove lower brake shoe and upper brake shoe. Remove nut and linkage rocker washer from eyebolt and remove upper eyebolt spring and washers. Remove eyebolt and attached parts from upper brake shoe.

**c. Installation of Brake Shoes** (fig. 227).

(1) INSTALL BRAKE SHOES. Install eyebolt, with parts attached, through end of upper brake shoe and install linkage rocker washer, eyebolt spring and second washer in end of eyebolt. Secure them in place by installing the nut on the end of the eyebolt. Then position upper brake shoe on anchor pin and brake drum and place lower brake shoe on anchor pin. Install castellated nut on front end of anchor pin, and lock nut and anchor pin with a cotter pin.

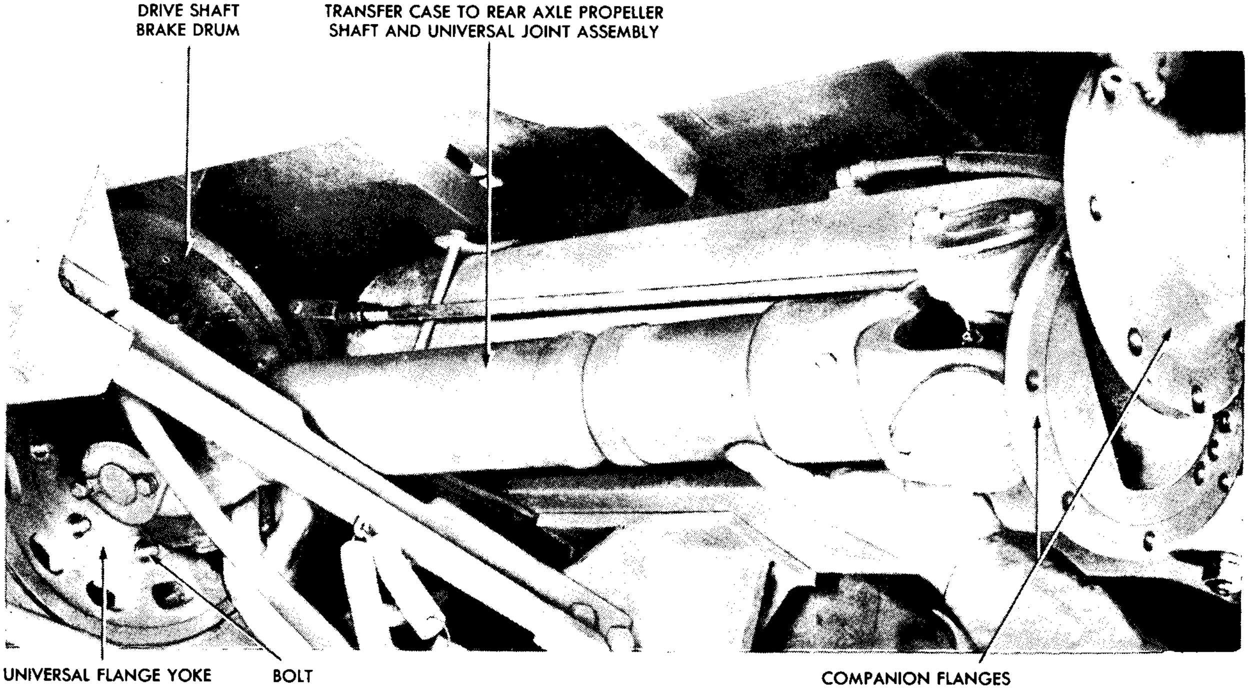
(2) INSTALL T-BRACKET. Then install on eyebolt, in order named, T-bracket, one linkage rocker washer, lower eyebolt spring, second linkage rocker washer, pad adjusting nut, and lock nut.

(3) INSTALL ROCKER. With rear of T-bracket swung toward left side of frame, install cam pin and cotter pin which secure rocker to T-bracket. From underneath vehicle secure T-bracket to drive shaft brake bracket with two bolts, nuts, and lock washers. Connect brake rod to actuating cam by installing cam pin and cotter pin which hold clevis yoke to cam.

(4) INSTALL DUMMY COUPLING PLATE. Install dummy coupling plate, locking four clips under frame side channels and tightening four cap screws. Adjust brake shoes (subpar. a above).

**d. Removal of Drum.** Loosen brake shoes at eyebolt adjusting nut. Remove eight nuts and lock washers which secure universal flange yoke to companion flange. Remove yoke, tap bolts through companion flange, and remove drum from brake shoes.

**e. Installation of Drum.** Lift brake drum into position inside shoes and place universal flange yoke in position over drum. Install eight bolts from rear of companion flange through the flange and universal flange yoke and secure drum and yoke by installing nuts and lock washers on bolts. Adjust brake shoes (subpar. **a** above).


DRIVE SHAFT
BRAKE DRUM
TRANSFER CASE TO REAR AXLE PROPELLER
SHAFT AND UNIVERSAL JOINT ASSEMBLY
UNIVERSAL FLANGE YOKE
BOLT
COMPANION FLANGES

RA PD 76899

*Figure 227—Removal of Universal Flange Yoke from Companion Flange at Drive Shaft Brake Drum*

## 174. LEVERS AND LINKAGE.

a. **Removal.** Remove clutch and brake cross shaft linkage (par. 79). Remove clevis pins and cotter pins which hold brake rod to cross shaft and to brake shoe actuating cam and remove rod.

b. **Installation.** Install clutch and brake cross shaft linkage (par. 79). Install brake rod and secure to cross shaft and brake shoe actuating cam with clevis and cotter pins. Adjust brake as instructed in paragraph 173.

## Section XXVI

# WHEELS, HUBS, WHEEL BEARINGS, AND TIRES

Paragraph
Wheels ........................................ 175
Hubs and wheel bearings ........................ 176
Tires .......................................... 177

## 175. WHEELS.

### a. Description and Data.

(1) Description. Single steel wheels are used on the front wheels and dual steel wheels are used on the rear wheels. The wheels are secured to the wheel studs and carry the tires which are mounted on a demountable rim and secured with a tire retaining ring.

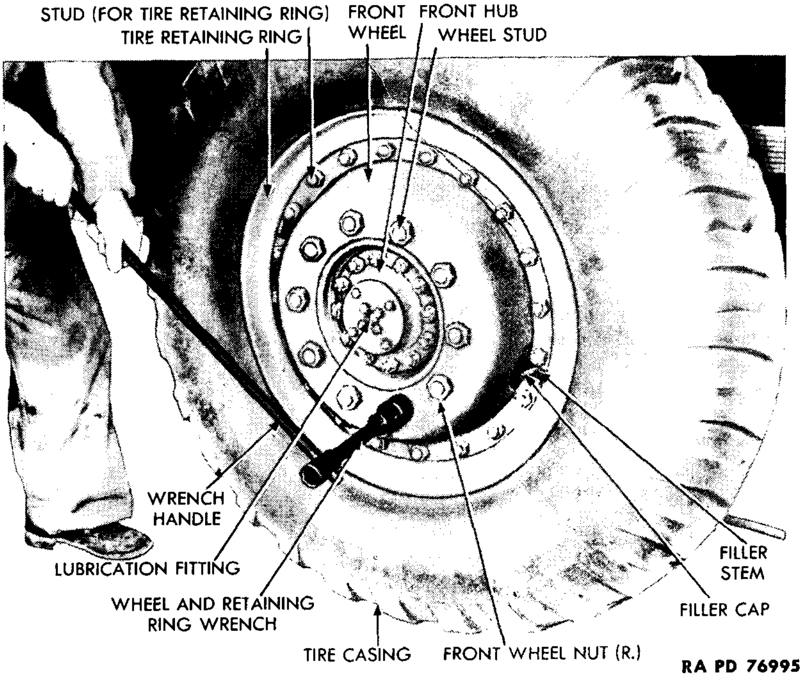

STUD (FOR TIRE RETAINING RING)
TIRE RETAINING RING
FRONT WHEEL
FRONT HUB
WHEEL STUD
WRENCH HANDLE
LUBRICATION FITTING
WHEEL AND RETAINING RING WRENCH
TIRE CASING
FRONT WHEEL NUT (R.)
FILLER STEM
FILLER CAP
RA PD 76995

*Figure 228—Removing Front Wheel and Tire Assembly*

(2) Data.

| | |
|---|---|
| Make | Budd |
| Size | 14.00–24 |

**b. Removal.** Jack up vehicle at wheel to be removed until tire is free of ground. Remove wheel nuts, using special wheel and retaining ring nut wrench and handle. Rock wheel off wheel studs and roll wheel and tire assembly to one side. Remove tire assembly (par. 177).

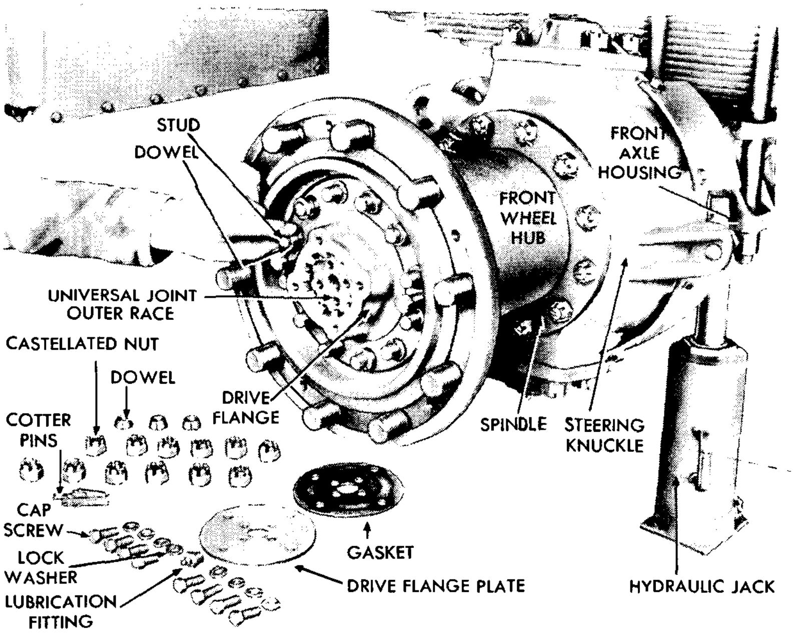
c. **Installation.** Install tire assembly in place and rock wheel onto wheel studs. Install wheel stud nuts and tighten them securely. Lower vehicle and remove jack.

## 176. HUBS AND WHEEL BEARINGS.

### a. Description and Data.

(1) DESCRIPTION.

*(a) Front Hubs.* The two front hub assemblies to which the front wheels are attached rotate on front wheel bearing cones and are secured on the spindles by means of a wheel bearing adjusting nut, lock washer, and lock nut.


STUD
DOWEL
FRONT AXLE HOUSING
FRONT WHEEL HUB
UNIVERSAL JOINT OUTER RACE
CASTELLATED NUT
DOWEL
DRIVE FLANGE
COTTER PINS
SPINDLE
STEERING KNUCKLE
CAP SCREW
LOCK WASHER
LUBRICATION FITTING
GASKET
DRIVE FLANGE PLATE
HYDRAULIC JACK

RA PD 76975

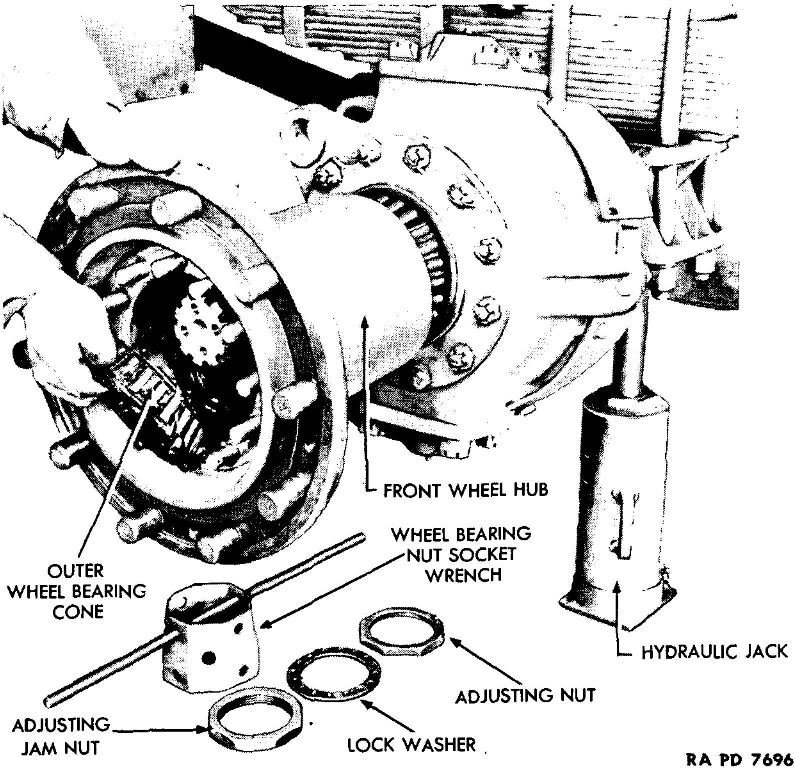
*Figure 229—Removal of Front Axle Drive Flange*

*(b) Rear Hubs.* There are four wheel and hub assemblies on the rear axle tandem unit, one at each end of each stationary carrier axle. The hub is bolted to the service brake drum and the stationary axle drive sprocket is bolted to the drum. Two of the four hub and drum assemblies have spacers between the sprocket and drum. Each hub rides on two roller type wheel bearings which are supported on the stationary carrier axle. Wheels are bolted to hub studs.

(2) DATA.

Bearings:

| | |
|---|---|
| Make | Timken |
| Model: | |
| Rear wheel outer bearing cone | Tim 941 |
| Rear wheel inner bearing cone | Tim 938 |
| Rear wheel inner and outer bearing cup | Tim 932 |
| Front wheel inner bearing cone | Tim 64450 |
| Front wheel outer bearing cone | Tim 62400 |
| Front wheel outer bearing cup | Tim 52638 |
| Front wheel inner bearing cup | Tim 64700 |


FRONT WHEEL HUB
WHEEL BEARING NUT SOCKET WRENCH
OUTER WHEEL BEARING CONE
HYDRAULIC JACK
ADJUSTING NUT
ADJUSTING JAM NUT
LOCK WASHER

RA PD 76968

*Figure 230—Removal of Outer Wheel Bearing Cone*

**b. Wheel Bearing.** Raise wheel clear of ground with a jack and remove eight cap screws and lock washers which hold drive flange plate and then remove plate. Use wheel bearing nut socket wrench and remove wheel bearing adjusting lock nut and lock washer. Tighten wheel bearing adjusting nut until wheel binds when turned.

Revolve wheel eight or ten times to be sure that all bearing surfaces are in contact and then back off the wheel bearing adjusting nut sufficiently to permit wheel to revolve freely. Install bearing lock washer and lock nut and remove jack.

**c. Removal of Front Hub and Wheel Bearings.**

(1) REMOVE FRONT WHEEL. Remove wheel from hub which is to be removed, following the procedure given in paragraph 175.

(2) REMOVE FRONT AXLE SHAFT DRIVE FLANGE (fig. 229). Remove eight cap screws and lock washers which hold front axle drive flange plate to universal joint outer race and to drive flange and lift off plate and gasket. Remove lubrication fitting from universal joint outer race. Next remove twelve cotter pins and castellated nuts which secure drive flange to hub studs. Use two puller screws and pull drive flange from hub sufficiently to remove the 12 dowels from hub studs. To remove dowels, loosen puller screws, tap drive flange back toward hub and lift dowels from studs and drive flange. Then again tighten puller screw until drive flange can be removed. Remove front axle drive flange gasket.

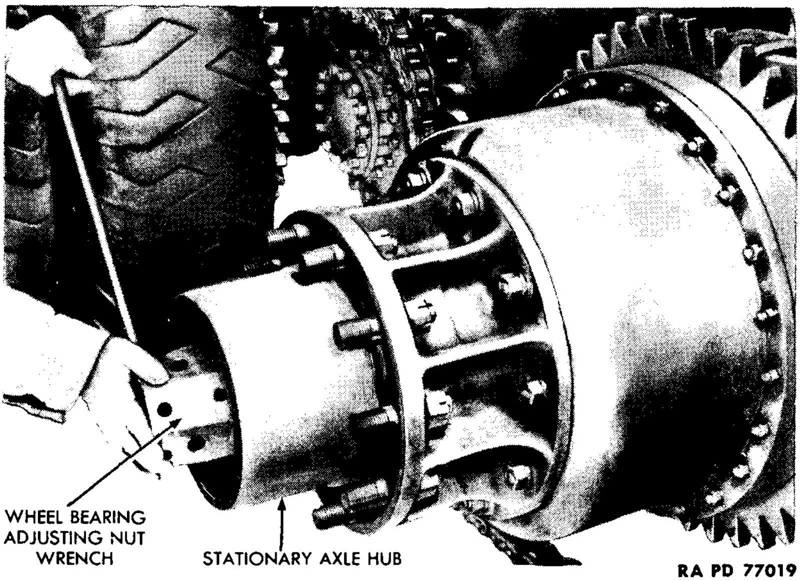
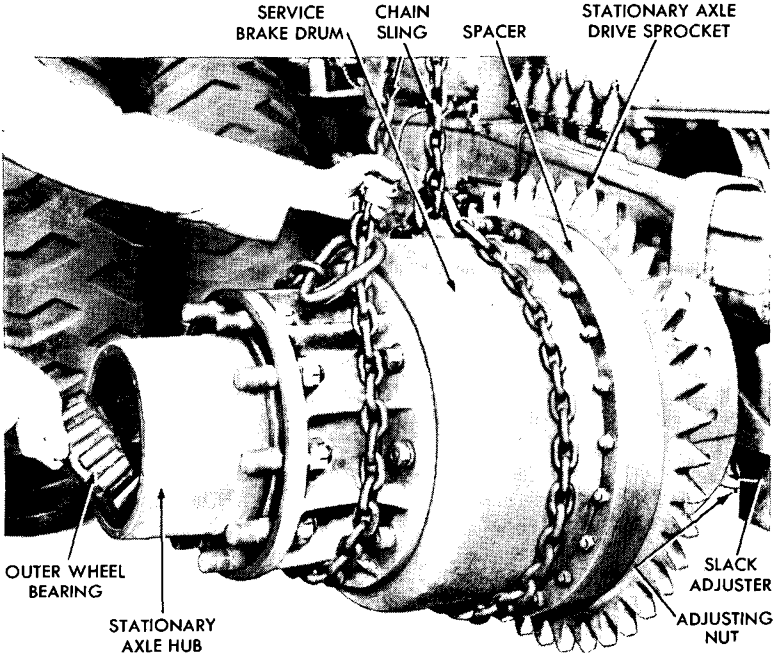


*Figure 231—Removal of Rear Wheel Bearing Adjusting Nut*

(3) REMOVE OUTER WHEEL BEARING CONE (fig. 230). Use special wheel bearing nut socket wrench to remove wheel bearing adjusting nut lock nut. Lift out lock washer and use same special wrench to remove wheel bearing adjusting nut. Pull hub forward slightly to loosen bearing cone, push hub back into its running position, and pull out cone.

(4) Remove Front Wheel Hub, Inner Bearing Cone and Seal (fig. 230). Lift front wheel hub outward and off of front axle spindle. Remove wheel inner bearing cone and oil seal from spindle. Drive inner and outer bearing cups out of hub.

d. **Maintenance.** Clean bearings in dry-cleaning solvent and remove all grease and dirt. Dry bearings with compressed air, being careful to direct air stream across rollers to prevent them from spinning. Inspect cones and rollers for scratches, pitting, or chipped rollers, and replace any damaged parts.


SERVICE BRAKE DRUM
CHAIN SLING
SPACER
STATIONARY AXLE DRIVE SPROCKET
OUTER WHEEL BEARING
STATIONARY AXLE HUB
SLACK ADJUSTER
ADJUSTING NUT

RA PD 76912

*Figure 232—Removal of Stationary Axle Hub and Drum Assembly*

e. **Installation of Front Hub and Bearings.**

(1) Install Inner and Outer Bearing Cups. Drive cups into hub, tapping around circumference of cups so that they will not cock. NOTE: *Use a brass drift to prevent damaging cups.*

(2) Install Inner Bearing Seal and Cone and Hub (fig. 230). Install front wheel bearing oil seal on spindle and install inner wheel bearing cone next to oil seal. Lift hub into position on spindle.

(3) Install Outer Wheel Bearing Cone and Bearing Nuts (fig. 230). Place outer wheel bearing cone in position in hub and install wheel bearing adjusting nut, using special wheel bearing nut

socket wrench. Tighten nut until hub binds when turned. Revolve hub eight or ten times to be sure all bearing surfaces are in contact. Then back off wheel bearing adjusting nut just enough to permit hub to revolve freely. Install wheel bearing adjusting nut lock washer and use same wrench to install wheel bearing adjusting nut lock nut.

(4) INSTALL FRONT AXLE SHAFT DRIVE FLANGE (fig. 229). Install a new front axle drive flange gasket over hub studs. Then place drive flange in position over studs and install the 12 dowels, castellated nuts, and cotter pins. Install front axle shaft drive flange plate on front axle shaft and universal joint assembly outer race and on drive flange, and secure the plate with eight cap screws and lock washers.

(5) INSTALL FRONT WHEELS. Follow the procedure given in paragraph 175.

**f. Removal of Stationary Axle Hub, Bearings and Oil Seal.**

(1) REMOVE DRIVE CHAIN AND WHEELS. Remove drive chain from stationary axle sprocket at hub which is to be removed, following the procedure outlined in paragraph 146. Remove wheels from hub, following the procedure given in paragraph 175.

(2) REMOVE WHEEL BEARING NUTS. Remove six cap screws and lock washers, which hold stationary axle hub cap to hub, and remove cap and gasket. Use wheel bearing nut wrench and remove wheel bearing adjusting nut lock nut. Remove lock washer and wheel bearing adjusting nut using same wrench (fig. 231).

(3) REMOVE HUB AND DRUM. Loosen adjusting nut on slack adjuster to eliminate any pressure of brake shoes against brake drums. Place a chain sling around hub and drum and use a hoist to take weight of hub and drum off of axle. Pull hub and drum assembly outward. As this is done the outer wheel bearing cone will come loose and can be lifted out. Remove hub assembly from axle and lower it to floor. Then remove inner wheel bearing from stationary carrier axle.

(4) REMOVE HUB OIL SEAL AND BEARING CUPS (fig. 233). Remove eight cap screws and lock washers which secure wheel bearing oil seal wiper to hub and remove wiper. Then position a pry bar through outer end of hub and against oil seal and drive around circumference of oil seal toward brake drum until it is driven from the hub. CAUTION: *Never install a used oil seal.* Drive inner and outer bearing cups from hub, being careful not to cock cups while driving them out.

(5) REMOVE BRAKE DRUM AND DRIVE SPROCKET ASSEMBLY. Remove nuts, lock washers and cap screws which secure drum to hub, and lift off drum and sprocket assembly.

**g. Installation of Stationary Axle Hub, Bearings and Oil Seal.**

(1) INSTALL BEARING CUPS AND OIL SEAL. Drive bearing cups into position in hub, being careful to tap around circumference of cups to prevent cocking and damaging them. Drive a new oil seal into position in brake drum side of hub in same manner. Install wheel

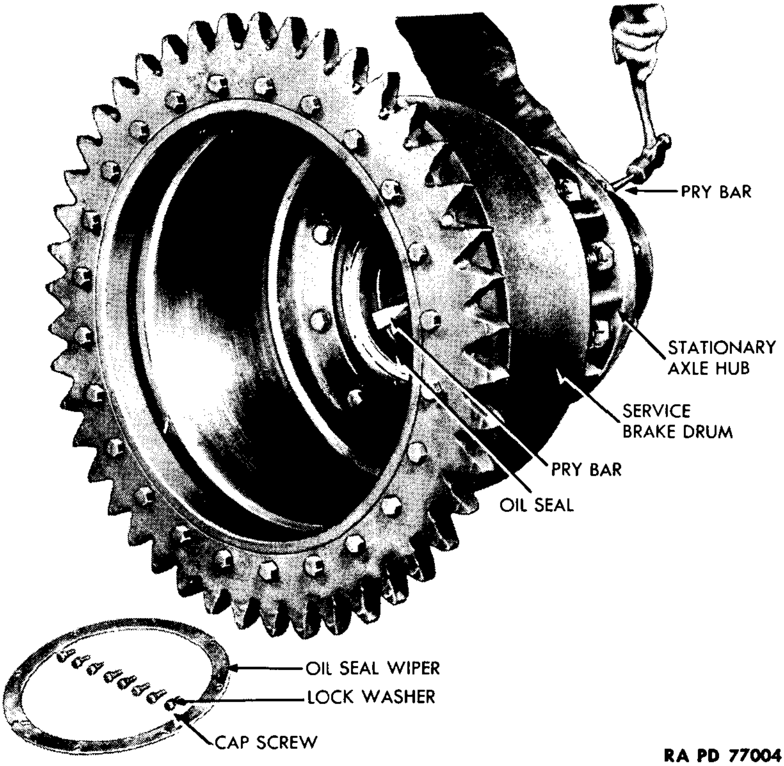


*Figure 233—Removal of Stationary Axle Hub Oil Seal*

bearing oil seal wiper over seal and secure it to hub with eight cap screws and lock washers.

(2) INSTALL BRAKE DRUM AND DRIVE SPROCKET ASSEMBLY. Place drum and sprocket assembly in position on hub and secure it to hub with cap screws, lock washers and nuts.

(3) INSTALL HUB AND DRUM ASSEMBLY. Place inner bearing cone in position on axle. Place a chain sling around hub and drum and use a hoist to lift assembly onto the axle, with brake drum in position over brake shoes. Before placing assembly over brake shoes, make sure that adjusting nut on slack adjuster has been loosened to prevent brake shoe from fitting tightly into brake drum. Then install outer wheel bearing cone on end of stationary carrier axle and into hub.

(4) INSTALL WHEEL BEARING NUTS AND ADJUST BEARINGS. Install wheel bearing adjusting nut on axle and tighten securely with wheel nut wrench. Then install lock washer next to nut, noting its position. Remove washer and back up nut a distance equivalent to

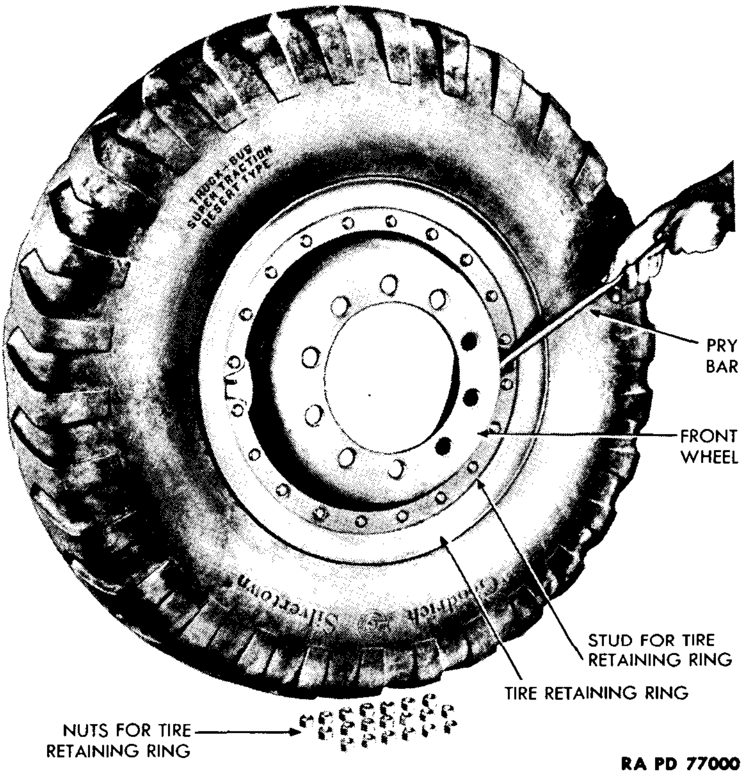

TRUCK-BUS SUPER TRACTION DESERT TYPE
Silvertown
Goodrich
PRY BAR
FRONT WHEEL
STUD FOR TIRE RETAINING RING
TIRE RETAINING RING
NUTS FOR TIRE RETAINING RING
RA PD 77000

*Figure 234—Removing Tire Retaining Ring*

ten holes in lock washer. Reinstall lock washer and install adjusting nut lock nut.

(5) INSTALL HUB CAP. Cement a new gasket to stationary axle hub cap and install cap and gasket on hub, securing cap with six cap screws and lock washers.

(6) INSTALL DRIVE CHAIN AND WHEELS. Install drive chains (par. 146). Install wheel and tire assemblies (par. 175).

## 177. TIRES.

### a. Description and Data.

(1) DESCRIPTION. The tires are of the combat or desert type and have puncture-proof inner tubes which are retained in the casing by a collapsible ring.

(2) DATA.

| | |
|---|---|
| Make | Goodyear or Goodrich |
| Type | combat or desert |
| Air pressure | 80 lb |

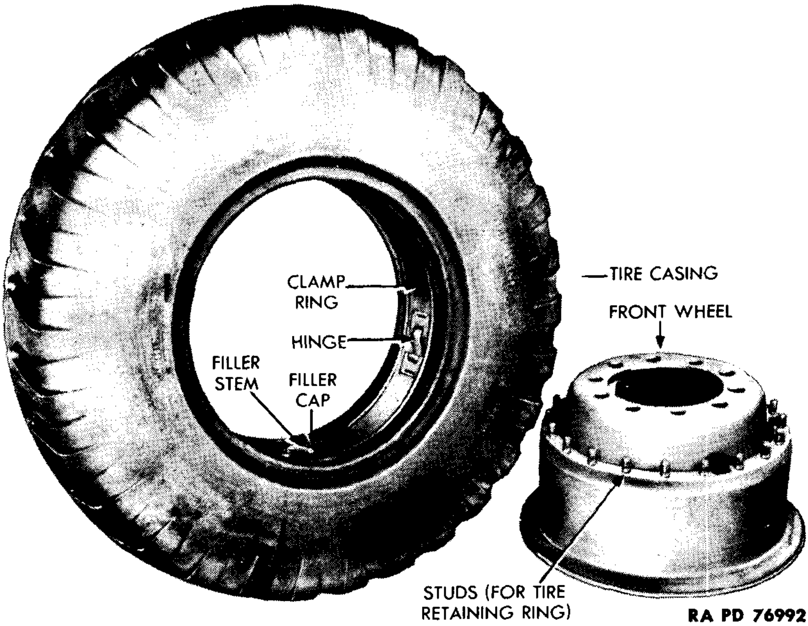

CLAMP RING
HINGE
FILLER STEM
FILLER CAP
TIRE CASING
FRONT WHEEL
STUDS (FOR TIRE RETAINING RING)
RA PD 76992

*Figure 235—Tire Casing and Tube Assembly*

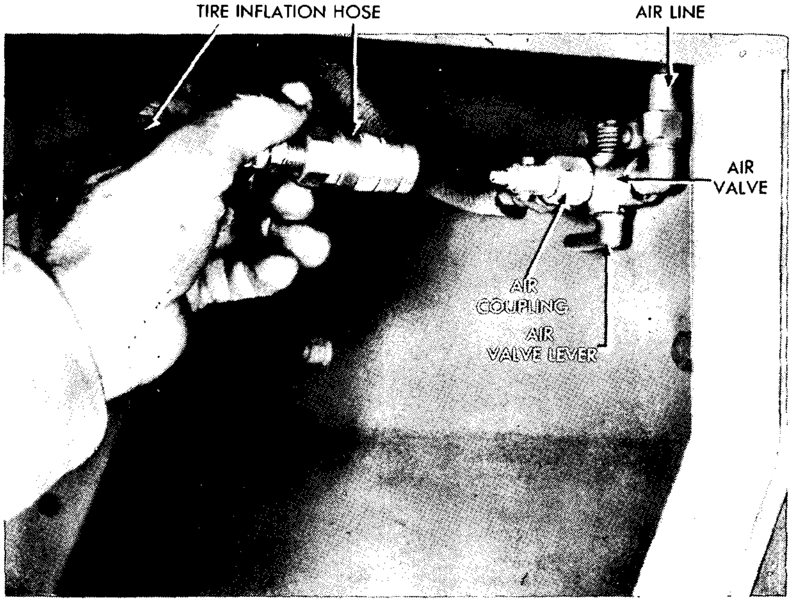

TIRE INFLATION HOSE
AIR LINE
AIR VALVE
AIR COUPLING
AIR VALVE LEVER
RA PD 77010

*Figure 236—Connecting Tire Inflation Hose*

**b. Removal.** Remove wheel and tire assembly (par. 176). Remove nuts which hold retaining ring on wheel and pry off ring. Push wheel out of tire, then collapse clamp ring and remove from tire casing. Pull tube out of casing.

**c. Maintenance.** Inspect casings and tubes for cuts and bruises. Repair tubes by cold patching. Report damaged tires to higher authority.

**d. Installation.** Install tube in tire casing. Then install clamp ring and expand ring. Install wheel in casing and secure with tire retaining ring. Install wheel and tire assembly on vehicle (par. 176).

**e. Inflation Hose.** The tractor has a tool box just to the rear of the left door (fig. 236). One of the items that is carried in this box is an air hose. An air coupling which is a part of the air system is secured to the rear side of this tool box. Tires of the tractor or semitrailer can be inflated by attaching the tire inflation hose to the coupling and then turning the air valve lever on the air coupling to its open position (fig. 236).

## Section XXVII

# SPRINGS AND SHOCK ABSORBERS

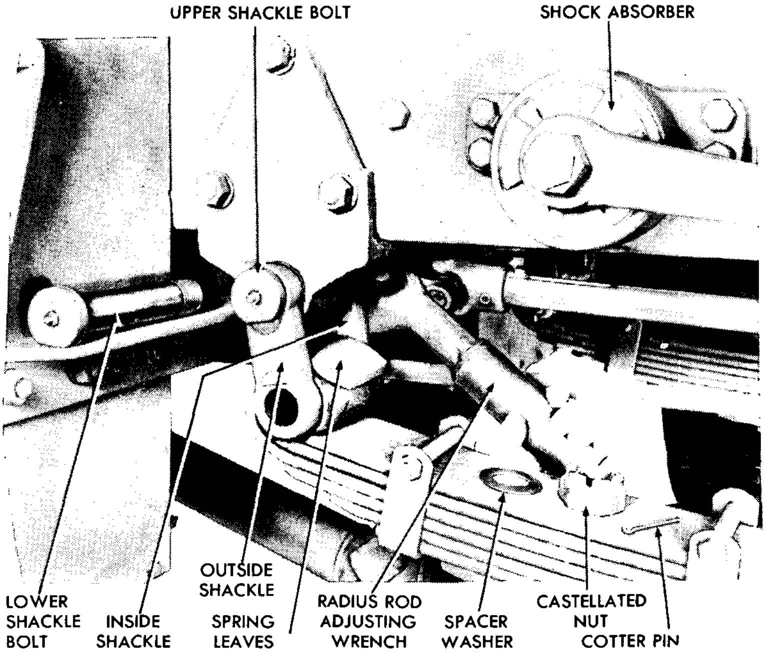
**Paragraph**

Front springs and shackles .............................. 178
Rear stabilizer springs .................................. 179
Shock absorbers and linkage .............................. 180

## 178. FRONT SPRINGS AND SHACKLES.

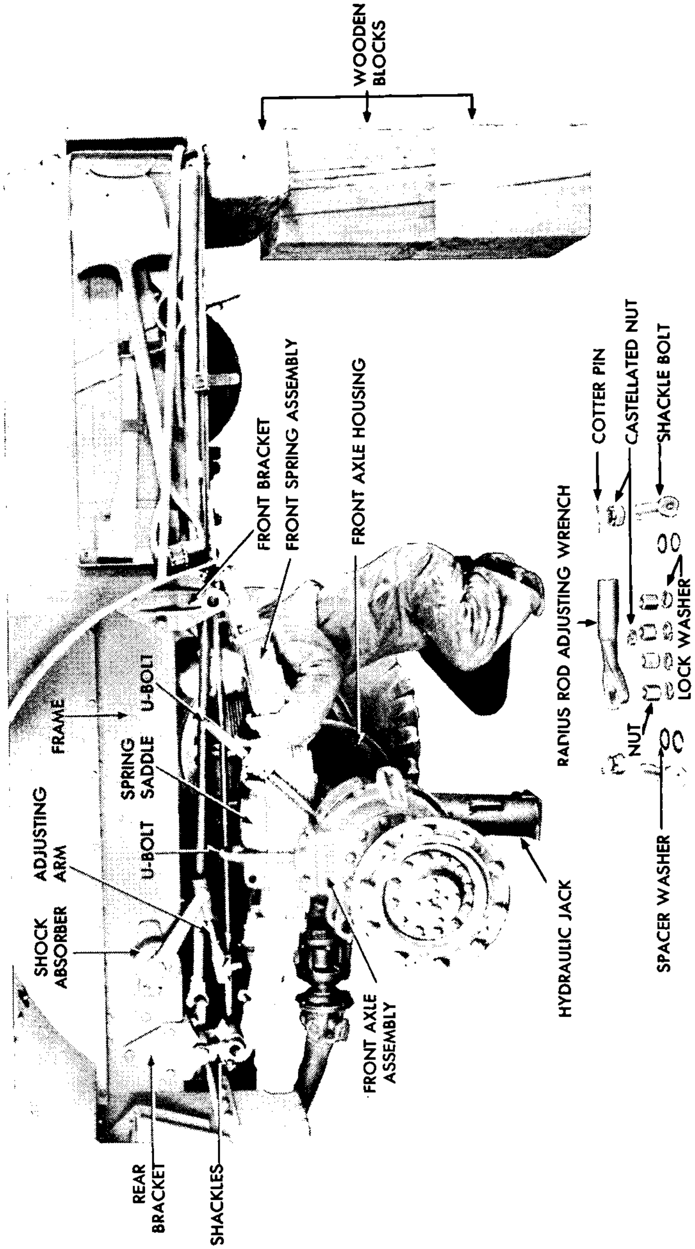
### a. Description and Data.

(1) DESCRIPTION (fig. 194). Two semielliptic leaf springs are suspended to frame brackets at the front of the vehicle by means of shackles at the rear of each spring and directly to the brackets at the front of the springs. The springs are secured to the front axle housing by two U-bolts and a spring saddle at each spring. The upper end of each shackle is secured to the hanger bracket by a shackle bolt and bushing. The rear of each spring is secured to the lower end of the shackle in the same manner. The front shackle bolt secures the spring to the front bracket by means of a front spring eye and bushing which is clipped to the front ends of the spring leaves.


UPPER SHACKLE BOLT
SHOCK ABSORBER
OUTSIDE SHACKLE
LOWER SHACKLE BOLT
INSIDE SHACKLE
SPRING LEAVES
RADIUS ROD ADJUSTING WRENCH
SPACER WASHER
CASTELLATED NUT
COTTER PIN

RA PD 76951

*Figure 237—Removal of Spring Shackles*


WOODEN BLOCKS
FRONT BRACKET
FRONT SPRING ASSEMBLY
FRONT AXLE HOUSING
COTTER PIN
CASTELLATED NUT
SHACKLE BOLT
RADIUS ROD ADJUSTING WRENCH
LOCK WASHER
NUT
SPACER WASHER
HYDRAULIC JACK
FRONT AXLE ASSEMBLY
U-BOLT
SPRING SADDLE
U-BOLT
FRAME
ADJUSTING ARM
SHOCK ABSORBER
REAR BRACKET
SHACKLES

RA PD 77006

*Figure 238—Removal of Front Springs*

**b. Removal of Spring Shackles** (fig. 237).

(1) JACK UP FRONT END OF VEHICLE. Using wooden blocks and a hydraulic jack, jack up front end of frame until weight of vehicle is taken off springs; this will eliminate binding at spring shackles.

(2) REMOVE SHACKLES. Then remove cotter pin and use radius rod adjusting nut wrench to remove castellated nut from lower shackle bolt at rear of spring. Drive bolt from spring and bushing. Remove two spacer washers. In a similar manner, remove upper shackle bolt and remove outside and inside shackles.

**c. Installation of Spring Shackles** (fig. 237). Install outer shackle on one shackle bolt. Then install a spacer washer and drive bolt through bracket and bushing. As bolt comes out back of bracket, install spacer washer, inner shackle and castellated nut. Tighten castellated nut with radius rod adjusting wrench and lock nut and bolt with a cotter pin. In a similar manner, install lower front spring shackle bolt through shackles and spring bushing. Lower vehicle to ground and remove jack and wood blocks.

**d. Front Spring Removal** (fig. 238).

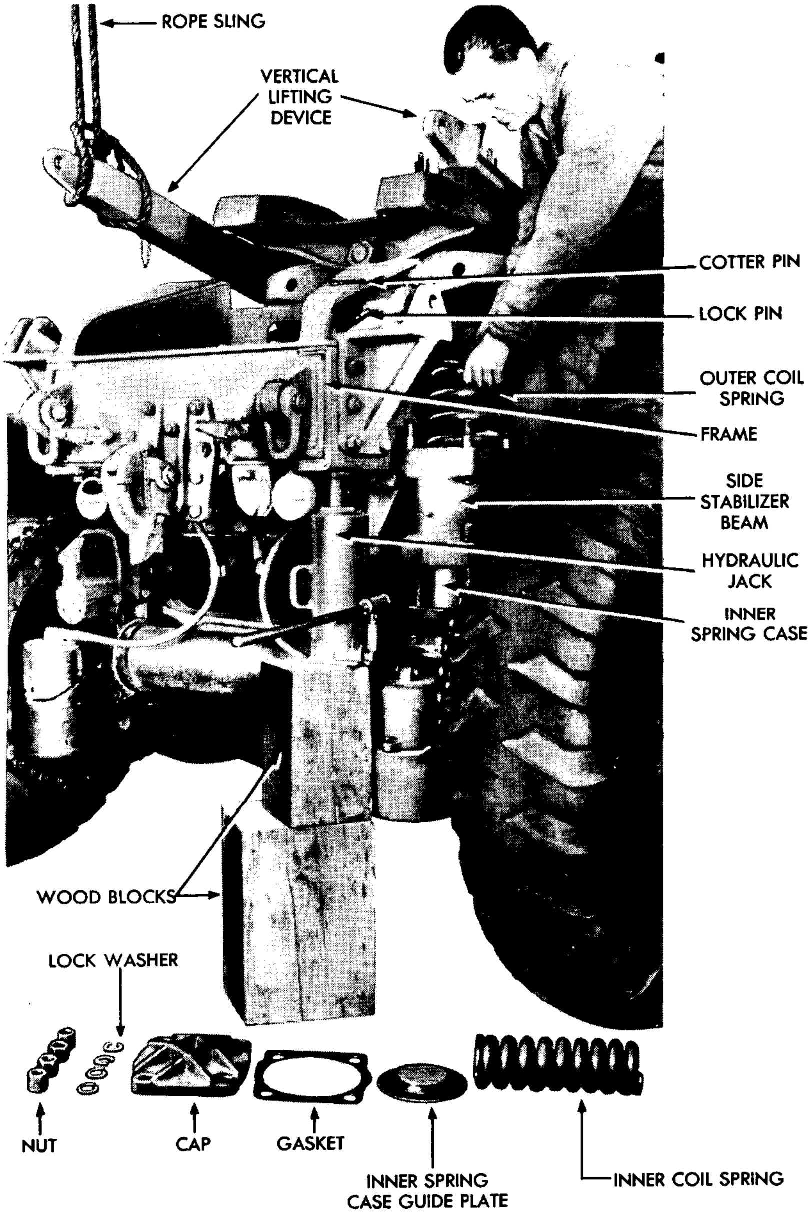
(1) JACK UP VEHICLE AND REMOVE WHEEL. Block rear wheels so vehicle will not move forward or backward. Use a hoist or wooden blocks and a hydraulic jack to jack up front end of frame. Place wooden blocks under front end of frame and remove jack or hoist. Then remove wheel from side of the vehicle from which spring is to be removed. Do not move jack from under axle housing after wheel has been removed.

(2) REMOVE FRONT SPRING. Disconnect shock absorber arm from spring saddle by removing cotter pin and castellated nut from adjusting arm and bolt. Drive arm and bolt free of saddle. Remove four nuts and lock washers which secure two U-bolts around spring saddle and spring and to front axle housing. Then remove cotter pin and use radius rod adjusting wrench to remove castellated nut from shackle bolt at front of spring and drive bolt from bracket and spring. Remove two spacer washers. In a similar manner, remove lower shackle bolt at rear end of spring. By means of hydraulic jack, lower axle housing and spring until two U-bolts can be removed. Remove spring saddle; then remove spring. Remove other spring in same manner.

**e. Front Spring Installation** (fig. 238).

(1) INSTALL SPRING. Block up front end of frame and position a hydraulic jack under front axle housing on side where spring is to be installed. Then lift spring into position on front axle housing. Install spring saddle and two U-bolts over saddle, dropping U-bolts over spring and through front axle housing bolt holes.

(2) INSTALL SPRING AND LOWER VEHICLE. By means of hydraulic jack, raise front axle housing and spring until front bracket and rear shackle holes are in alinement with bushings in ends of spring. Insert a spacer washer at each side of bushing at each end of spring. Then drive lower rear spring shackle bolt through shackles and bushing at


ROPE SLING
VERTICAL LIFTING DEVICE
COTTER PIN
LOCK PIN
OUTER COIL SPRING
FRAME
SIDE STABILIZER BEAM
HYDRAULIC JACK
INNER SPRING CASE
WOOD BLOCKS
LOCK WASHER
NUT
CAP
GASKET
INNER SPRING CASE GUIDE PLATE
INNER COIL SPRING

RA PD 76914

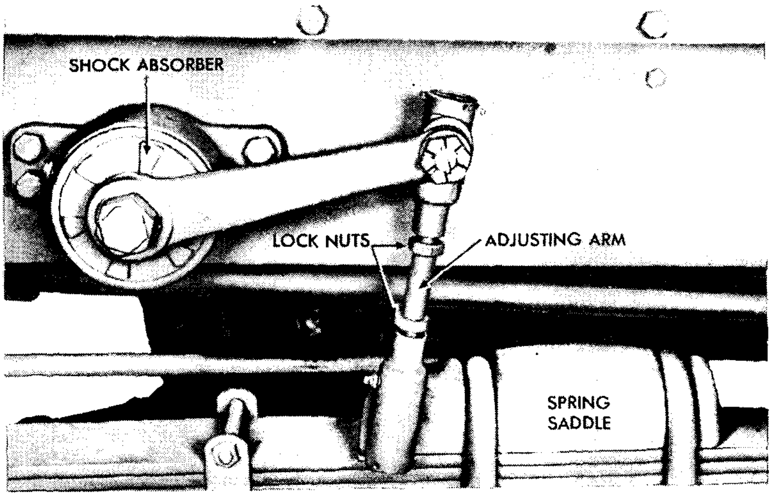
*Figure 239—Removal of Stabilizer Springs*

rear end of spring. Use a radius rod adjusting wrench to install castellated nut which secures bolt in place. Lock nut and bolt with a castellated nut. In a similar manner, install shackle bolt at front end of spring. Install other front spring in same manner.

## 179. REAR STABILIZER SPRINGS.

**a. Description and Data** (fig. 239).

(1) DESCRIPTION. The stabilizer springs consist of two coil springs, an inner and an outer, located in an inner spring case in the rear end of each side stabilizer beam. The inner spring case rests on the end of a leaf spring which is secured to the end of the side stabilizer beam. The coil springs and inner case are secured in the spring opening in the end of the side stabilizer beam by an inner spring case end guide plate and stabilizer spring cap.



RA PD 76986

*Figure 240—Adjustment of Shock Absorber*

(2) DATA.

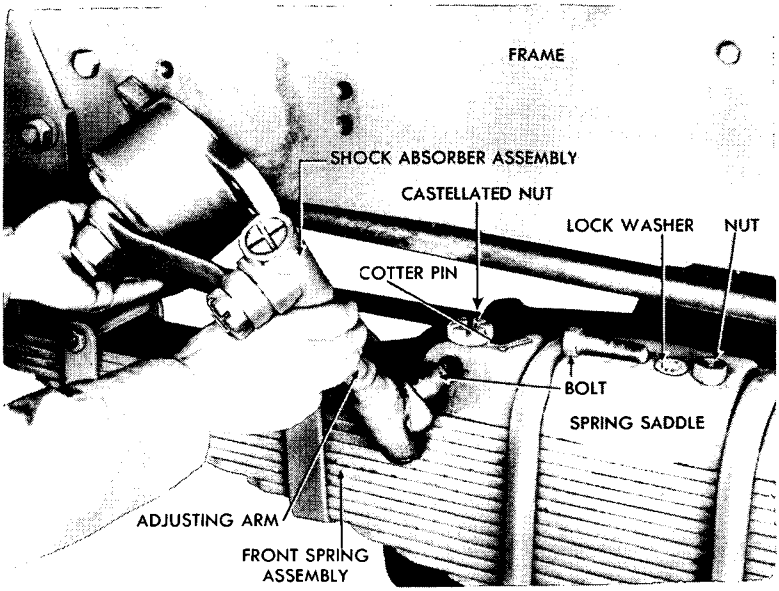
Type .................................... coil
Number used ................ 2 inner and 2 outer

**b. Removal** (fig. 239).

(1) LIFT VERTICAL LIFTING DEVICE. In order to lift inner and outer coil springs from inner spring case, it is necessary to lift the vertical lifting device. Remove two rear lock pins by first removing cotter pin from end of each lock pin. Use a hoist and rope sling to lift rear end of the vertical lifting device upward about a foot; if a hoist is not available, two men can lift it, and the vertical lifting device can be blocked up.

(2) JACK UP REAR OF FRAME. Place a hydraulic jack on wooden blocks and jack up rear end of frame sufficiently for all pressure of coil springs to be taken off stabilizer spring cap.

(3) REMOVE COIL SPRINGS. Remove four nuts and lock washers which secure cap to studs on end of side stabilizer beam and remove cap and gasket. Lift out inner spring case end guide plate and remove inner and outer coil springs. NOTE: *If left-hand stabilizer springs are to be removed, remove two bolts, nuts, and lock washers which secure chain guard to side stabilizer beam, and remove chain guard before removing stabilizer spring cap.*



RA PD 76978

***Figure 241—Removal of Shock Absorber***

c. **Installation** (fig. 239).

(1) INSTALL COIL SPRINGS. Install outer and inner coil springs in inner spring case. Install spring inner case and guide plate on top of springs. Install a new gasket and stabilizer spring cap. If left-hand springs are being installed, install chain guard with two straps over studs on end of side stabilizer beam and secure guard to beam with two bolts, nuts, and lock washers. Secure cap to studs with four nuts and lock washers.

(2) SECURE VERTICAL LIFTING DEVICE AND LOWER FRAME. Lower vertical lifting device and secure it in place by installing rear lock pins and secure lock pins with cotter pins. Lower rear of frame and remove jack and wooden blocks.

## 180. SHOCK ABSORBERS AND LINKAGE.

a. **Description.** Two cam and lever type shock absorbers are used to control front spring action and absorb road shocks. One shock absorber is secured to each side of frame, and each shock absorber adjusting arm is attached at its lower end to the spring saddle.

b. **Adjustment** (fig. 240). Loosen two lock nuts on shock absorber adjusting arm. Then turn adjusting arm, extending length of arm to increase shock absorber pressure and shortening length to decrease pressure. When desired adjustment has been attained, tighten lock nuts.

c. **Removal** (fig. 241). Remove cotter pin and castellated nut which secure shock absorber adjusting arm to spring saddle. Then remove four bolts, nuts, and lock washers which secure shock absorber to frame. NOTE: *To remove these bolts, it is necessary to remove the right-hand engine compartment side cover and hold nuts, at inside of right-hand frame side channel, to prevent them from turning while bolts are unscrewed from outside frame. Lift shock absorber and linkage from vehicle. Remove second shock absorber in same manner.*

d. **Installation** (fig. 241). Lift shock absorber into position inserting adjusting bolt and lower bolt through hole in spring saddle. Secure shock absorber to frame with four bolts, nuts and lock washers holding nuts at inside of right-hand frame side channel while tightening bolts from outside of frame. Secure arm to spring saddle by installing a castellated nut and cotter pin on bolt. Install right-hand engine compartment side cover. Adjust shock absorber, if necessary, as outlined in subparagraph **b** above.

## Section XXVIII

## STEERING GEAR AND HYDRAULIC SYSTEM

Paragraph
Description and data for system ........ 181
Hydraulic pump ........ 182
Hydraulic cylinder and piston ........ 183
Hydraulic control valve ........ 184
Hydraulic oil reservoir, oil lines, and connections ........ 185
Steering wheel ........ 186
Steering arm ........ 187
Drag link ........ 188
Steering adjustments ........ 189

### 181. DESCRIPTION AND DATA FOR SYSTEM.

**a. Description** (fig. 242). The steering system consists of the steering gear assembly, which has a hydraulic cylinder with piston secured to the top of the steering gear housing, and a hydraulic control valve secured to the bottom of the steering gear housing. The hydraulic portion of the system consists of a hydraulic oil reservoir, secured to the inside of the rear engine cover, and connected by oil lines to a hydraulic pump located on the left side of the engine and driven by the engine sprocket chain. The hydraulic pump delivers the oil under pressure to the hydraulic control valve. A bypass is provided in the pump so that if oil is not required at the control valve, it is bypassed. If the steering wheel is turned to the right, or the left, the hydraulic system comes into operation automatically and is of great assistance to the operator in turning the vehicle. This is accomplished by piping the oil under pressure from the control valve to the hydraulic cylinder where it actuates the piston which applies pressure on the steering gear levers. Whenever effort at the steering wheel is released, the oil pressure becomes balanced and the hydraulic system is inoperative, causing the oil again to be bypassed at the pump.

**b. Data.**

Steering Gear:

| | |
|---|---|
| Make | Ross |
| Model | 780 |
| Type | hydraulic |

Hydraulic Pump:

| | |
|---|---|
| Make | Bendix |
| Model | 332872 |

Hydraulic Reservoir, Valve and Cylinder:

| | |
|---|---|
| Make | Bendix |

## STEERING GEAR AND HYDRAULIC SYSTEM

### 182. HYDRAULIC PUMP.

a. **Description** (fig. 244). The hydraulic pump is a rotor type pump mounted on the left side of the engine. It is in operation during the time the engine is running and is driven from the governor drive shaft through a flexible coupling on the end of the pump drive shaft. It draws oil through a line from the reservoir and delivers the oil under pressure through an outlet line to the valve.

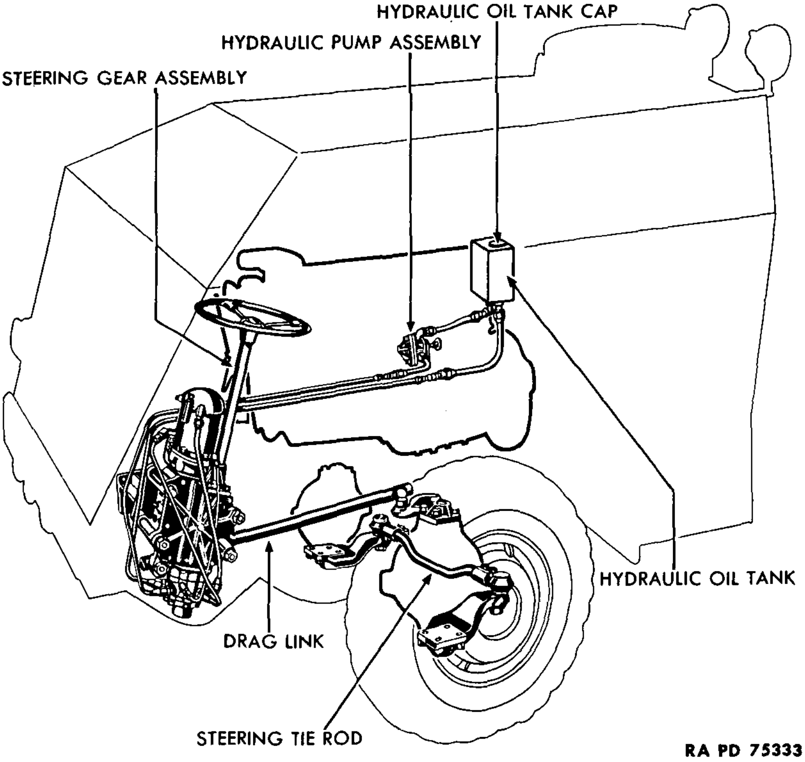

HYDRAULIC OIL TANK CAP
HYDRAULIC PUMP ASSEMBLY
STEERING GEAR ASSEMBLY
HYDRAULIC OIL TANK
DRAG LINK
STEERING TIE ROD
RA PD 75333

*Figure 242—Hydraulic Steering System—Schematic View*

b. **Removal.** Loosen clamps and remove carburetor to air duct pipe. Disconnect hydraulic oil flexible inlet and outlet hose from pump. Remove two flexible coupling nuts and bolts which hold coupling to flexible coupling flange. Remove four cap screws and lock washers which hold hydraulic pump to bracket on upper crankcase and lift pump assembly off upper crankcase.

c. **Installation.** Install pump on upper crankcase and fasten with four cap screws and lock washers. Connect flexible coupling to flexible coupling flange and fasten with two bolts and nuts. Connect hydraulic oil flexible hose to pump. Install carburetor to air duct pipe. Bleed system (par. 185).

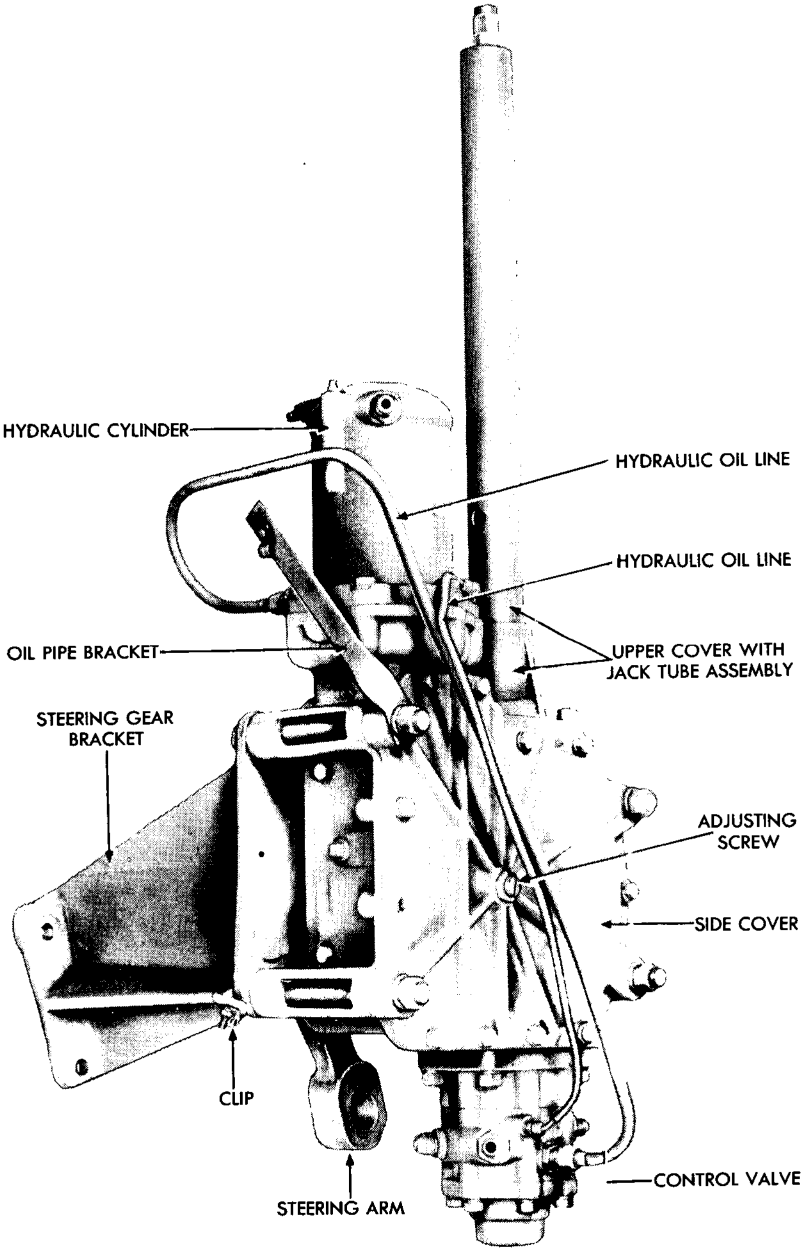

HYDRAULIC CYLINDER
HYDRAULIC OIL LINE
HYDRAULIC OIL LINE
OIL PIPE BRACKET
UPPER COVER WITH JACK TUBE ASSEMBLY
STEERING GEAR BRACKET
ADJUSTING SCREW
SIDE COVER
CLIP
CONTROL VALVE
STEERING ARM
RA PD 74951

*Figure 243—Steering Gear Assembly*

## 183. HYDRAULIC CYLINDER AND PISTON.

a. **Description** (fig. 245). The steering hydraulic cylinder is a hollow steel casting which is secured to the top of the steering gear housing. Oil lines connect the hydraulic control valve to the top and the bottom of the cylinder. The hydraulic steering piston operates inside the cylinder.

b. **Removal.**

(1) DISCONNECT OIL LINES. Disconnect oil line at control valve which is located at the bottom of the steering gear housing and drain oil into a receptacle. Disconnect oil lines at top and bottom of hydraulic cylinder.

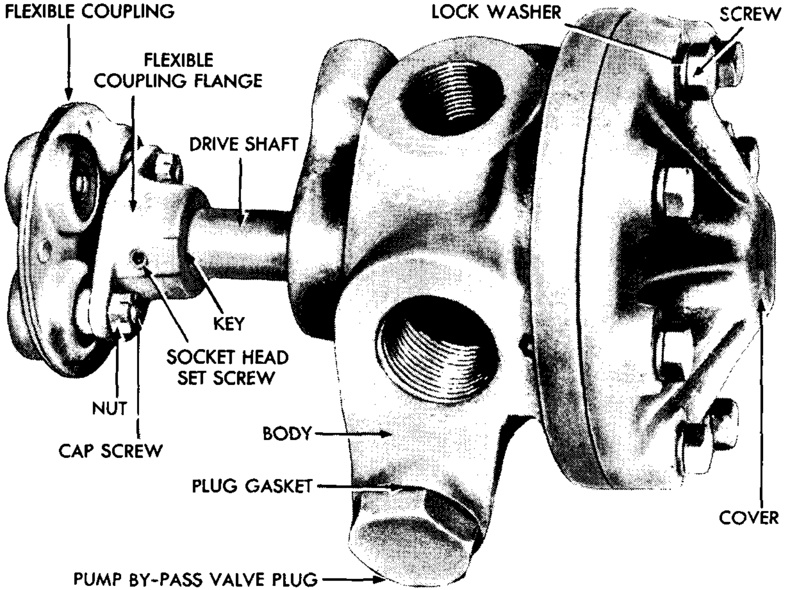

FLEXIBLE COUPLING
LOCK WASHER
SCREW
FLEXIBLE COUPLING FLANGE
DRIVE SHAFT
KEY
SOCKET HEAD SET SCREW
NUT
CAP SCREW
BODY
PLUG GASKET
COVER
PUMP BY-PASS VALVE PLUG
RA PD 74942

*Figure 244—Hydraulic Pump*

(2) REMOVING STEERING GEAR HOUSING COVER. Remove cab left corner filler by removing five cap screws and lock washers, and two nuts and lock washers from two bolts. Remove five cap screws and lock washers which hold steering gear housing cover and remove cover. Remove bolt, nut, and lock washers which hold clutch pedal pad, and remove pad.

(3) REMOVE CLUTCH PEDAL FLOOR PLATE. Remove five cap screws and lock washers which hold clutch pedal floor plate to floor. Remove two cap screws which hold dimmer switch in place. Lift floor plate up and over clutch pedal.

(4) REMOVE CYLINDER. Remove six cap screws and lock washers which hold hydraulic cylinder to steering gear housing and pull cylinder off hydraulic piston.

(5) REMOVE PISTON. Remove cotter pin and nut which hold piston on piston rod, then remove piston nut washer and piston assembly.

**c. Installation.**

(1) INSTALL PISTON AND CYLINDER. Install piston on piston rod, place piston rod washer on rod, and secure piston to rod with nut and cotter pin. Install cylinder over piston, push cylinder down carefully under steering gear housing and secure with six screws.

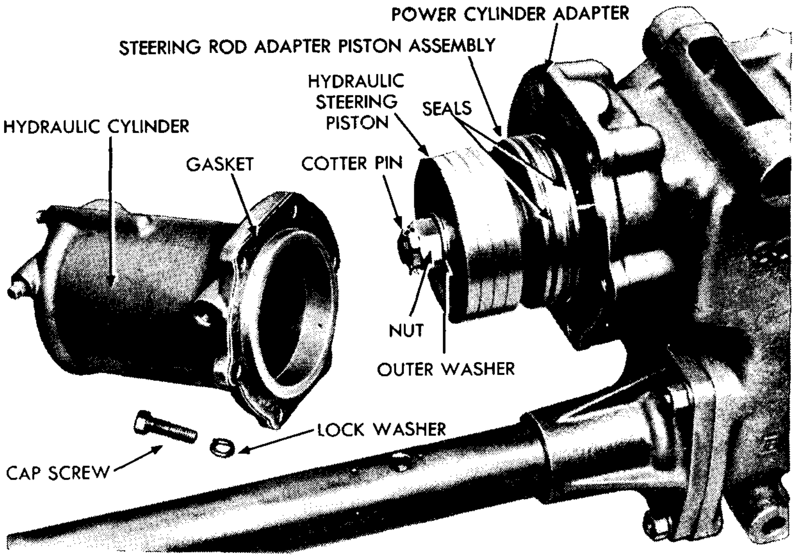

POWER CYLINDER ADAPTER
STEERING ROD ADAPTER PISTON ASSEMBLY
HYDRAULIC STEERING PISTON
SEALS
HYDRAULIC CYLINDER
GASKET
COTTER PIN
NUT
OUTER WASHER
LOCK WASHER
CAP SCREW
RA PD 74986

*Figure 245—Steering Hydraulic Cylinder Removed*

(2) INSTALL OIL LINES. Connect oil lines at top and bottom of cylinder. Then connect oil line at control valve which was disconnected for draining during removal.

(3) FILL HYDRAULIC OIL RESERVOIR AND BLEED. Fill hydraulic oil reservoir and bleed air from system as instructed in paragraph 185.

(4) INSTALL CLUTCH PEDAL FLOOR PLATE. Install floor plate over clutch pedal and onto cab floor. Install dimmer switch on floor plate and secure with two cap screws. Secure floor plate to cab floor with five cap screws and lock washers.

(5) INSTALL STEERING GEAR HOUSING COVER. Install clutch pedal pad on clutch pedal and secure with bolt, nut, and lock washer.

Install steering gear housing cover and secure with five cap screws and lock washers. Install cab left corner filler and secure with five cap screws and lock washers, and two nuts and lock washers on two bolts.

## 184. HYDRAULIC CONTROL VALVE.

**a. Description.** The hydraulic control valve is a spring-loaded, plunger type of valve which is secured to the bottom of the steering gear housing. The valve is connected to the hydraulic pump at its inlet side and to both ends of the hydraulic cylinder at the outlet side by oil lines.

**b. Removal** (fig. 246). Remove bolts, nuts, and lock washers that hold steering gear bottom cover on frame and remove cover. Disconnect oil lines from valve fittings. Remove cap screws and lock washers which hold steering control valve cap on steering valve housing and remove cap. Remove set screw from steering control valve cap nut, then remove nut, camshaft valve, lower thrust washer, roller bearing, and spacer from worm shaft. Pull steering control valve assembly off camshaft.

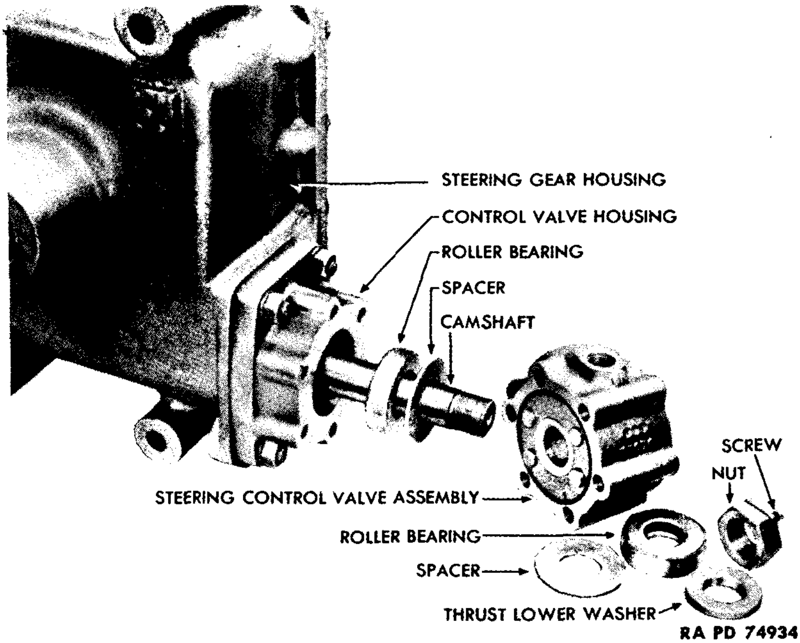

STEERING GEAR HOUSING
CONTROL VALVE HOUSING
ROLLER BEARING
SPACER
CAMSHAFT
SCREW
NUT
STEERING CONTROL VALVE ASSEMBLY
ROLLER BEARING
SPACER
THRUST LOWER WASHER
RA PD 74934

*Figure 246—Steering Control Valve Removed*

**c. Installation** (fig. 246). Install steering control valve assembly on steering gear, then install spacer, lower bearing, camshaft lower thrust washer, and nut on camshaft. Adjust bearings (par. 189). Install and tighten set screw in nut, and then install steering control valve cap on steering control valve housing, and secure with cap screws and lock washers. Connect oil lines to valve fittings and bleed system (par. 185). Install steering gear bottom cover on frame and secure with bolts, nuts, and lock washers.

## 185. HYDRAULIC OIL RESERVOIR, OIL LINES, AND CONNECTIONS.

**a. Description** (fig. 247). The hydraulic oil reservoir is located on the inside of the rear engine cover and is accessible for filling by removing a cover on the top of the engine top cover and then removing the cap on the hydraulic reservoir. The oil lines and oil hose connect the hydraulic pump, the pump to the hydraulic control valve, and the control valve to the hydraulic cylinder. The oil lines are connected by inverted flared tube nuts on the ends of the flared tubes, and the oil hose is composed of fittings on the end of the rubber hose.

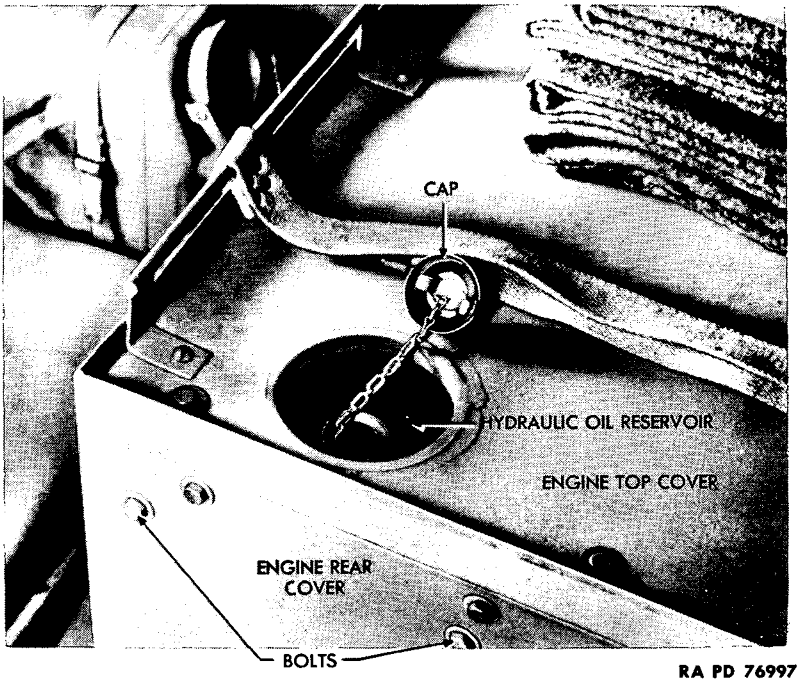


*Figure 247—Hydraulic Oil Reservoir*

**b. Removal of Hydraulic Oil Reservoir.** Remove engine left side cover, then disconnect two oil hose from reservoir. Remove four bolts, nuts, and lock washers, and remove reservoir.

**c. Installation of Hydraulic Oil Reservoir.** Install reservoir and fasten with four bolts, nuts, and washers. Connect two oil hose to reservoir. Install engine left side cover.

**d. Bleeding System.** Fill reservoir with oil, then turn steering wheel one turn to the left of center position. Open bleeder valve to lower bleed hole and start engine, then turn steering wheel to the left until oil comes through the open bleeder valve. Stop turning the wheel and allow oil to flow until it is free from air, and then close valve. Repeat the above procedure with the upper bleed hole open and the steering wheel turned to the right. NOTE: *During bleeding process keep sufficient oil in the reservoir to cover the ports at all times. At the finish of the bleeding operation, fill reservoir to its proper level.*

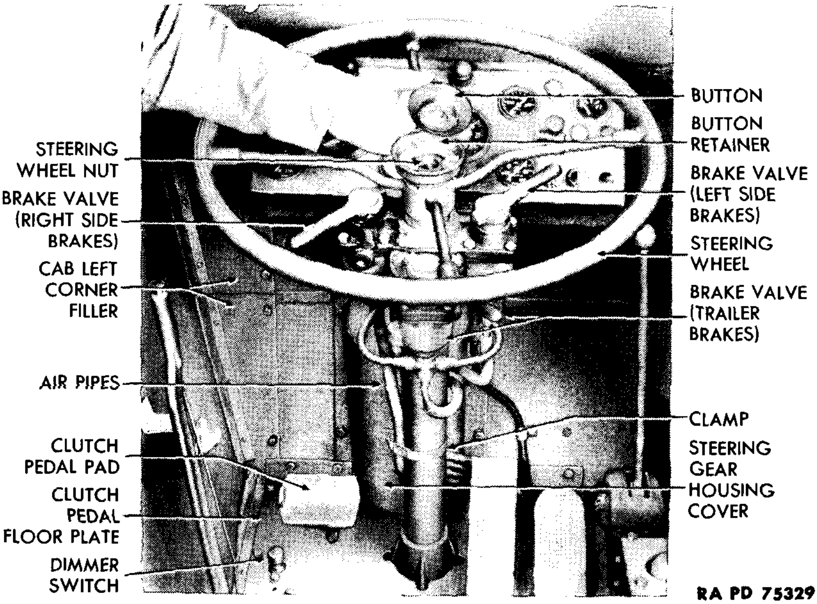

STEERING WHEEL NUT
BRAKE VALVE (RIGHT SIDE BRAKES)
CAB LEFT CORNER FILLER
AIR PIPES
CLUTCH PEDAL PAD
CLUTCH PEDAL FLOOR PLATE
DIMMER SWITCH
BUTTON
BUTTON RETAINER
BRAKE VALVE (LEFT SIDE BRAKES)
STEERING WHEEL
BRAKE VALVE (TRAILER BRAKES)
CLAMP
STEERING GEAR HOUSING COVER
RA PD 75329

*Figure 248—Removing Steering Wheel Button*

**e. Removal and Installation of Oil Lines and Hose.** Remove oil lines by unscrewing flared tube nuts and each end of line from fittings to which they are attached. Remove hose in the same manner.

## 186. STEERING WHEEL.

**a. Description.** The steering wheel is located at the top of the steering gear column and is secured to the steering gear camshaft.

**b. Removal.** Remove button in center of steering wheel by pressing down and turning about ¼ turn. Remove three screws that hold button retainer and remove retainer. Remove steering wheel nut and lift steering wheel off steering gear camshaft.

**c. Installation.** Install steering wheel on camshaft and fasten with steering wheel nut. Install button retainer and fasten with three screws. Install button by pressing down and turning about ¼ turn.

## 187. STEERING ARM.

**a. Description.** The steering arm is secured to the lever shaft of the steering gear, and connects the steering gear to the drag link, in order to transmit the movement of the gear to the drag link, and thence to the front wheels.

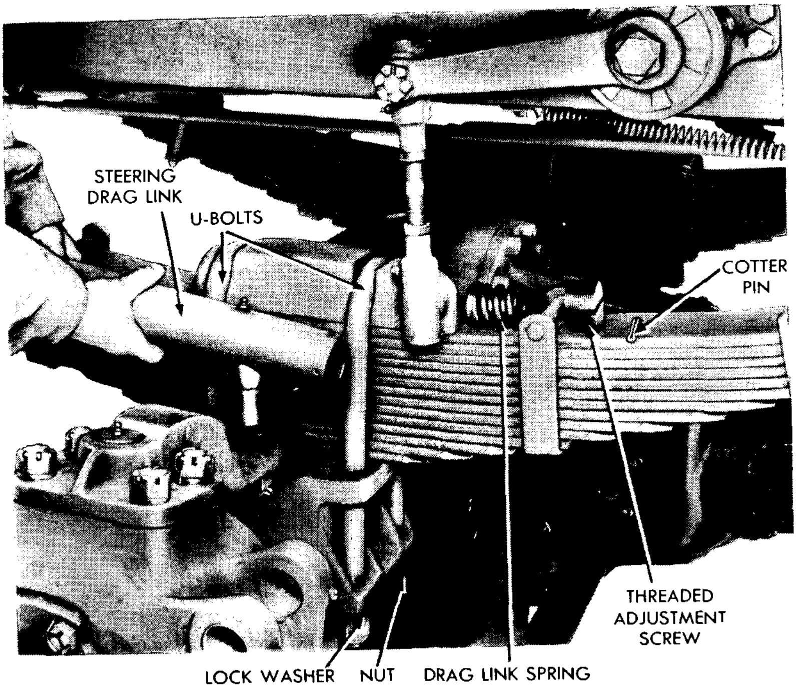


*Figure 249—Disconnecting Steering Drag Link*

**b. Removal.** Mark position of arm on lever shaft. Then remove cotter pin and plug which hold drag link to arm, and remove drag link from arm. Remove nut and lock washer which hold arm onto lever shaft, and pull arm off shaft. CAUTION: *Do not hammer arm off unless a support is used against end of lever shaft. Use light blows with hammer as they are more effective.*

**c. Installation.** Install steering arm on lever shaft so that marks made at removal line up. Then install lock washer and nut, and tighten securely. Install drag link on arm and secure with cotter pin.

## 188. DRAG LINK.

**a. Description.** The drag link is the means of connecting the steering arm of the steering gear to the left front wheel steering knuckle, which in turn is connected to the right front wheel steering knuckle by a tie rod. It consists of a tube with ball sockets at each end which are held in position by a spring and threaded plug.

**b. Removal.** Remove cotter pin and plug, at each end of drag link, and lift drag link off steering arm and steering knuckle.

**c. Installation.** Turn front wheels in straight-ahead position and install drag link on steering arm and steering knuckle. Screw plug into both ends of drag link and secure with cotter pin.

## 189. STEERING ADJUSTMENTS.

**a. General.** There are two principal adjustments on this steering gear and a supplemental adjustment on the stud-roller bearing unit in the lever shaft. Principal adjustments are the adjustment of the roller thrust bearings on the camshaft, and the adjustment of the tapered stud in the cam groove for backlash. If an adjustment is required on the stud-roller bearing unit in the lever shaft, report condition to higher authority. When making adjustments outlined in steps **b** and **c** below, free the steering gear of all load by disconnecting the drag link from the left front wheel steering knuckle (par. 188).

**b. Adjustment of Roller Thrust Bearings on Camshaft.** Remove the steering control valve cap by removing six cap screws and lock washers. Make an adjusting flange tool by using a 3/8-inch flat steel stock. Using the steering control valve cap as a template, drill bolt holes and cut out a hole in the center of the flat steel stock large enough to clear the thrust washer and bearing. If steel stock is not available, make an adjusting tool out of a spare steering control valve cap. Cut off the end of the cap at a point approximately 1/4 inch from the outer flanged edge of the cap. Loosen the housing side cover adjusting screw (fig. 243). Use three of the cap screws which held the steering control valve cap in place and install the adjusting flange tool over the end of the shaft and against the valve body, and secure with these three screws. Remove set screw from adjusting nut. Tighten adjusting nut so there is no play in the upper or lower bearings. A test can be made by turning the steering wheel with the thumb and forefinger. There should be no perceptible drag felt in the steering wheel. If a drag is felt, loosen the adjusting nut and test again. After proper adjustment has been made, install set screw in adjusting nut, remove the adjusting flange tool, and install the steering control valve cap on the steering control valve housing. Secure the cap with lock washers and cap screws.

**c. Adjustment of Tapered Stud in Cam Groove for Backlash.** Place steering gear in midposition. Tighten the housing side cover adjusting screw (fig. 243) until a very slight drag is felt through midposition when turning the steering wheel slowly from one extreme position to the other. While holding the adjusting screw, tighten lock nut. Recheck drag by turning steering wheel. Adjustment is correct if a slight drag is felt through midposition. Connect drag link to left front wheel steering knuckle (par. 188).

## Section XXIX

# CAB AND FRAME

Paragraph
Description and data . . . . . . . . . . 190
Front bumper . . . . . . . . . . 191
Pintle hook . . . . . . . . . . 192
Air horn and horn button assembly . . . . . . . . . . 193
Seats, cushions, and seat frames . . . . . . . . . . 194
Armor plate doors . . . . . . . . . . 195
Windshields . . . . . . . . . . 196
Windshield wipers . . . . . . . . . . 197

## 190. DESCRIPTION AND DATA.

**a. Description.**

(1) CAB. The cab is constructed of armor plate which is welded together and secured to the chassis frame. The cab provides armor plate protection to the crew, engine, fuel, and engine cooling systems.

(2) FRAME. The chassis frame is of straight channel iron construction and consists of two side rails with cross members riveted together, and strengthened by gusset plates.

**b. Data.**

| | Make |
|---|---|
| Frame unit | Pacific Car |
| Cab | Pacific Car |
| Front bumper | Pacific Car |
| Pintle hook | Pacific Car |
| Air horn | Westinghouse |
| Windshield wiper | Owen Dyneto (model 1739) |

## 191. FRONT BUMPER.

**a. Description.** The front bumper is bolted to bumper mounting angles at the front end of the frame. Front blackout lights are supported on brackets which are mounted on the back of the bumper.

**b. Removal.** Remove two bolts, nuts, and lock washers which hold each blackout light bracket to bumper, and remove lights and brackets. Remove bolt, nut, lock washer, and clamp which hold blackout light cable to rear center of bumper. From both sides of bumper, remove four bolts, nuts, and lock washers which hold bumper to outer bumper mounting angles, and two bolts, nuts, and lock washers, which hold bumper to inner bumper mounting angles. Then, from both sides of bumper, remove one bolt, nut, and lock washer, that secures bumper to bottom of front end of frame-side channels and lift bumper from vehicle.

c. **Installation.** Lift front bumper into position on front end of vehicle, and in each end of front bumper install four bolts, nuts and lock washers that hold bumper to outer bumper mounting angles, and two bolts, nuts, and lock washers that hold bumper to inner bumper mounting angles. Then install bolt, nut, and lock washer that holds bumper to front end of frame side channels. Secure one blackout light bracket to each side of bumper with two bolts, nuts, and lock washers. Insert blackout light cable under clamp and install clamp to back of bumper with a bolt, nut, and lock washer.

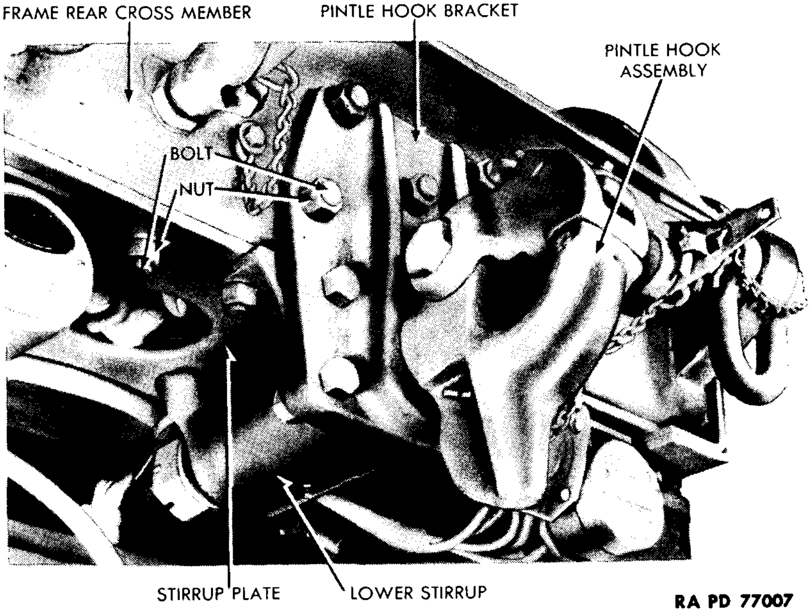


*Figure 250—Removal of Pintle Hook Assembly*

## 192. PINTLE HOOK.

a. **Description** (fig. 250). A standard army pintle hook assembly is secured to the rear end of the frame by means of two brackets. The pintle hook is provided as a means of attaching a towing cable when a cable is used to recover disabled materiel or for securing a drawbar lunette.

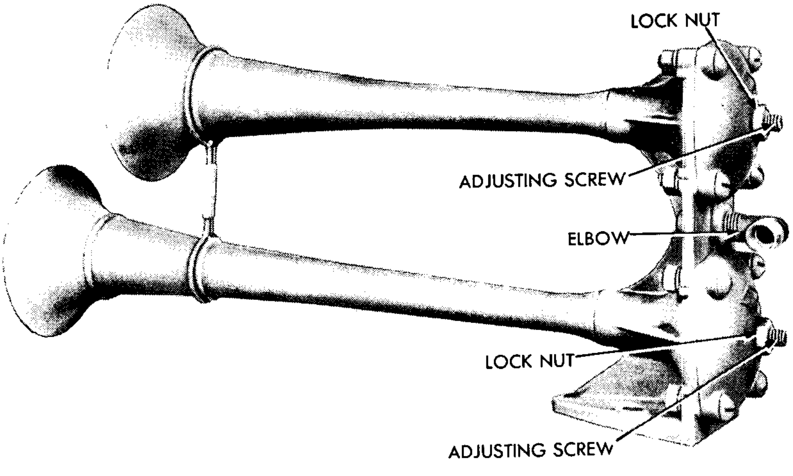
b. **Removal** (fig. 250). Remove four bolts, nuts, and lock washers that secure pintle hook lower stirrup to pintle hook stirrup plate. Then remove the five top bolts, nuts, and lock washers that hold pintle hook bracket to frame rear cross member, and lift pintle hook assembly from vehicle.

c. **Installation** (fig. 250). Lift pintle hook assembly into position at rear of frame with pintle hook bracket alined with bolt holes in frame rear cross member. Secure bracket to frame by installing the five upper bolts, nuts, and lock washers. Secure pintle hook stirrup to pintle hook stirrup plate by installing four bolts, nuts, and lock washers.

## 193. AIR HORN AND HORN BUTTON ASSEMBLY.

a. **Description** (fig. 251). The horn assembly for signaling is operated by compressed air from the air system and is located inside right radiator door where it is secured to cab. The horn button is secured to the radiator cover at the driver's right.

b. **Adjustment of Air Horn.** Loosen lock nut at rear of horn and turn adjusting screw in, or out, until desired tone is obtained, then tighten lock nut.



RA PD 77027

*Figure 251—Air Horn Assembly*

c. **Removal of Air Horn.** Disconnect air line from elbow at rear of horn assembly. Remove two bolts, nuts, and lock washers that hold horn to frame cross member and remove horn.

d. **Installation of Air Horn.** Install horn on cross member and fasten with two bolts, nuts, and lock washers. Connect air line to elbow at rear of horn.

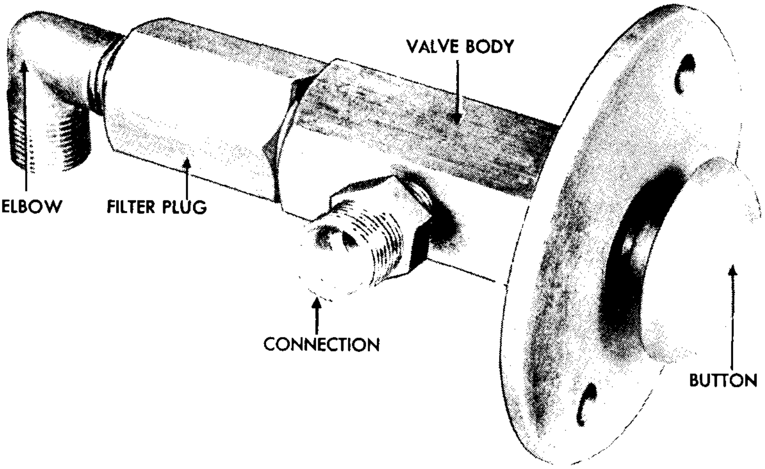
e. **Removal of Horn Button Assembly.** Reach inside radiator door opening and disconnect two air lines from fittings in horn button valve body and filter plug. Remove two bolts, nuts, and lock washers which hold button assembly to radiator side cover, and remove assembly.

f. **Installation of Horn Button Assembly.** Install horn button assembly on radiator side cover and fasten with two bolts, nuts, and lock washers. Connect two air lines to fittings in horn button valve body and filter plug.

## 194. SEATS, CUSHIONS, AND SEAT FRAMES.

**a. Description.** There are seven seats in the cab: gunner's seat, four crew seats, commander's seat, and driver's seat. Two of the crew seats are secured to the rear wall of the cab and two are secured to the side walls of the cab. The driver's seat is at the left front corner of the cab and the commander's seat is directly across the cab in the right front corner. The gunner's seat is secured to the center of the rear wall of the cab. The right rear crew seat frame houses the storage batteries and the left rear frame contains tool and parts stowage.

**b. Adjustment.** The gunner's seat is operated by a lever. Pushing lever down unlocks seat so that it can be lowered for use. The gunner's seat is the only seat that is adjustable.



RA PD 77044

*Figure 252—Horn Button Assembly*

**c. Removal and Installation of Crew Seat Cushions and Backs.**

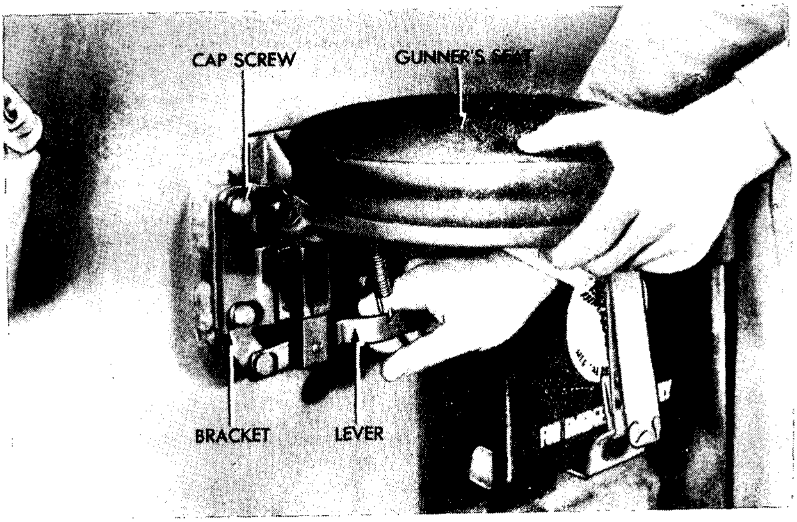
(1) REMOVAL. Remove backs by lifting up and off retainers which are welded to sides of cab, then lift seat cushions off seat frame.

(2) INSTALLATION. Install backs on retainers and then install cushions on seat frames.

**d. Removal and Installation of Crew Seat Frames.**

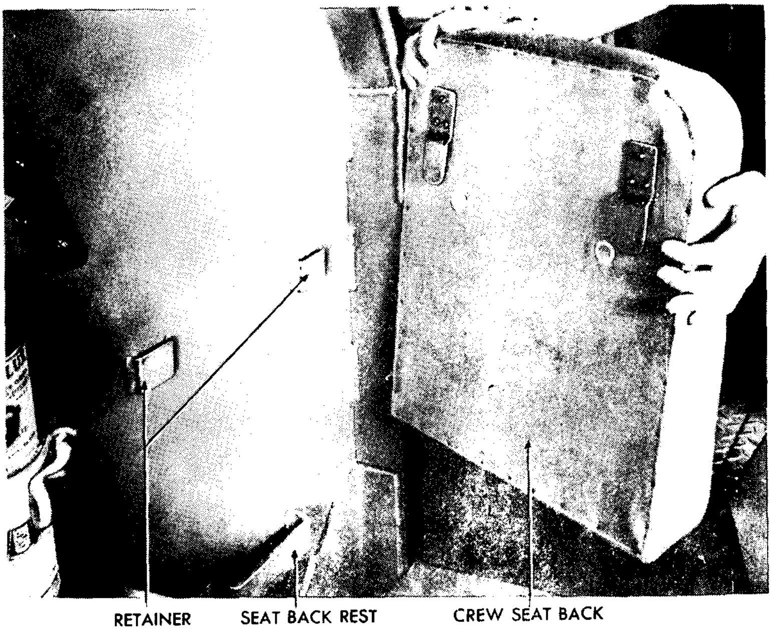
(1) REMOVAL. Remove bolts, nuts, and lock washers which hold rear frames to cab and side seats to wheel housings.

(2) INSTALLATION. Install frames and secure to cab or wheel housings with bolts, nuts, and lock washers.


CAP SCREW
GUNNER'S SEAT
BRACKET
LEVER

RA PD 76949

*Figure 253—Gunner's Seat*


RETAINER
SEAT BACK REST
CREW SEAT BACK

RA PD 76939

*Figure 254—Removing Crew Seat Back*

**e. Removal and Installation of Driver's Seat, Commander's Seat and Frames.**

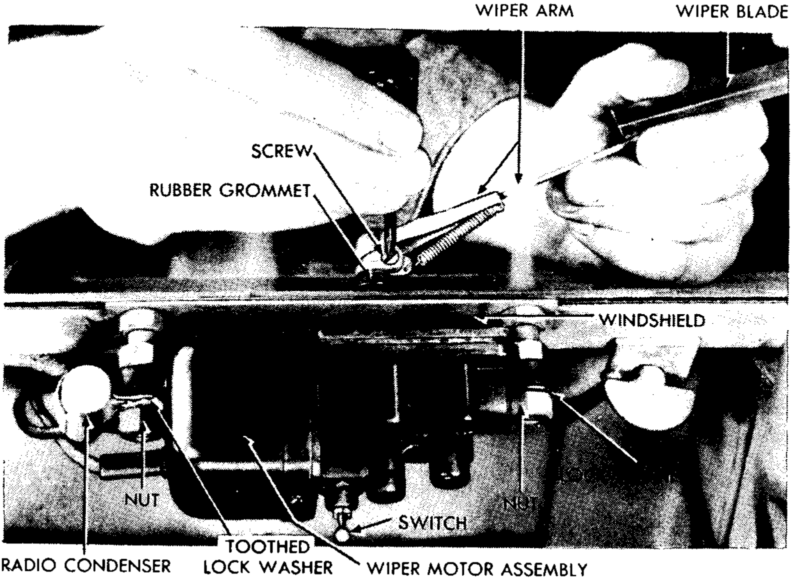
(1) REMOVAL. Both of these seats have the seat cushion and back in one frame. Remove bolts, nuts, and lock washers which secure frames to wheel housing, and remove seat assembly.

(2) INSTALLATION. Install seat assembly and secure to wheel housing with bolts, nuts, and lock washers.

**f. Removal and Installation of Gunner's Seat.**

(1) REMOVAL. The gunner's seat is fastened to a bracket which is welded on rear of cab, and is removed by taking out four cap screws and lock washers.

(2) INSTALLATION. Install seat on bracket and secure with four cap screws and lock washers.



RA PD 76974

*Figure 255—Removing Windshield Wiper*

## 195. ARMOR PLATE DOORS.

**a. Description.** The cab window doors, radiator, and windshield doors are hinged. The hinge halves are welded to the shutters and cab.

**b. Removal.** Drive out hinge pins and remove door.

**c. Installation.** Install door and drive hinge pin into place.

## 196. WINDSHIELDS.

**a. Removal.** The windshields are removed by pulling wiper motor socket out of its connection and then loosening thumb screws that hold windshield in place. Store windshields in racks on side of cab.

**b. Installation.** Remove windshields from racks on side of cab, install in place, and fasten with thumb screws. Connect wiper motors

## 197. WINDSHIELD WIPERS.

**a. Description.** The two windshield wipers are electrically operated and each has a switch so that either, or both, can be turned off, or on. The wipers are secured to the windshield frame.

**b. Removal.** Disconnect green and red wires from wiper motor. Remove screw that holds wiper arm on motor shaft and pull wiper arm with wiper blade off motor shaft. Remove rubber grommet from outside of motor shaft. Remove two nuts, lock washers, internal-external toothed washer and radio condenser from wiper studs. Pull wiper motor assembly away from windshield, and off studs.

**c. Installation.** Install wiper motor on studs and install radio condenser, internal-external toothed washer, lock washer, and nuts. Install rubber grommet on outside end of motor shaft. Install wiper arm on motor shaft and secure it with screw. Connect wires to wiper motor terminals.

## Section XXX

# INSTRUMENTS

Paragraph
Gages and instruments on instrument panel ................ 198
Switches ................................................ 199

## 198. GAGES AND INSTRUMENTS ON INSTRUMENT PANEL.

**a. Description.** The instrument panel is located in front of the driver, and is hinged at the bottom to the cab. The panel can be lowered, in order to work on the inside, by removing two thumb screws and lowering panel. The gages and instruments used in the operation of the vehicle are located on the instrument panel and secured to it at the front.

**b. Replacement.** Before removing any instruments or gages, remove left windshield (par. 196) and disconnect battery (par. 127).

(1) RIGHT FUEL TANK GAGE.

*(a) Removal.* Remove two nuts, plain washers, and lock washers which hold wires to gage terminals, and remove wires. Then remove two nuts and lock washers that hold gage to clamp. Remove clamp from gage and lift out gage.

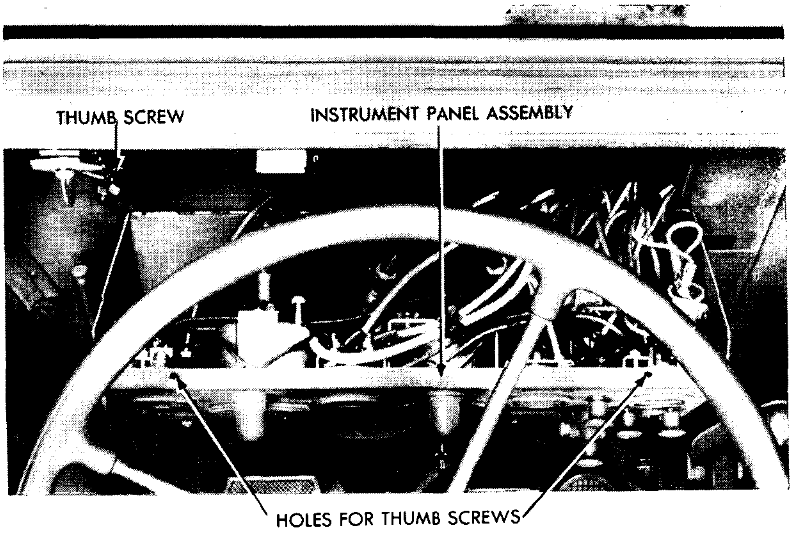
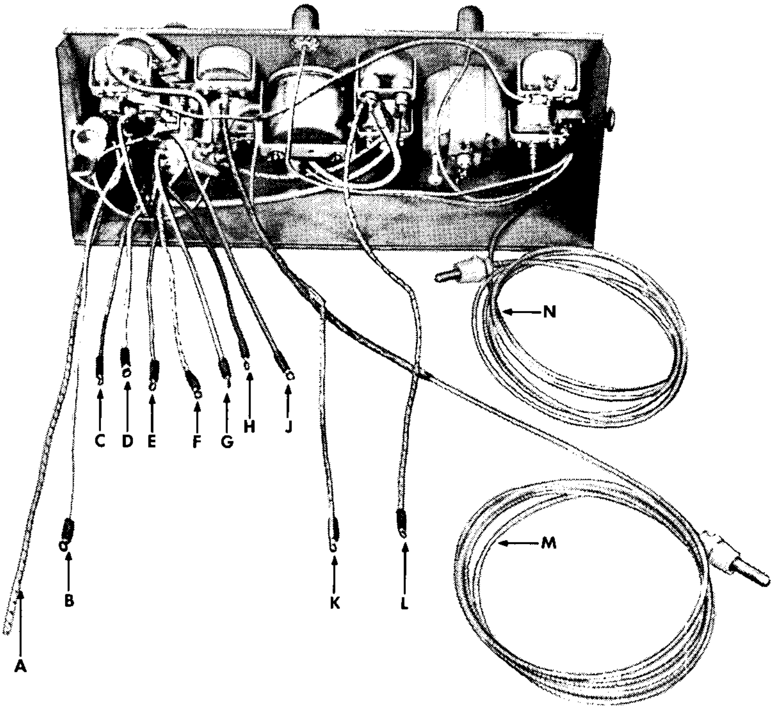


*Figure 256—Instrument Panel in Vehicle*

## INSTRUMENTS



A—STARTER BUTTON TO MAGNETIC STARTER SWITCH (GREEN, NO. 10, RED TRACER)

B—SIREN LIGHT SWITCH TO BOTTOM OF NO. 8 FUSE (YELLOW, NO. 14)

C—BLACKOUT DRIVE LIGHT SWITCH TO TOP OF RESISTOR ON FUSE BLOCK (GREEN, NO. 14)

D—RIGHT IGNITION SWITCH TO TOP OF NO. 6 FUSE (YELLOW, NO. 14)

E—LEFT IGNITION SWITCH TO TOP OF NO. 5 FUSE (RED, NO. 14)

F—"SW" ON LIGHT SWITCH TO TOP OF NO. 4 FUSE (YELLOW NO. 12 WITH RED, BROWN TRACER)

G—"BHT" ON LIGHT SWITCH TO TOP OF NO. 3 FUSE (GREEN, NO. 10)

H—"BHT" ON LIGHT SWITCH TO TOP OF NO. 2 FUSE (BLACK, NO. 14)

J—"HT" ON LIGHT SWITCH TO TOP OF NO. 1 FUSE (RED, NO. 10)

K—FUEL AND OIL GAGES TO BOTTOM OF NO. 5 FUSE (GREEN, NO. 14)

L—RIGHT SIDE OF AMMETER TO TOP OF NO. 8 FUSE (GREEN, NO. 10 WITH RED, BROWN TRACER)

M—OIL TEMPERATURE CABLE

N—WATER TEMPERATURE CABLE

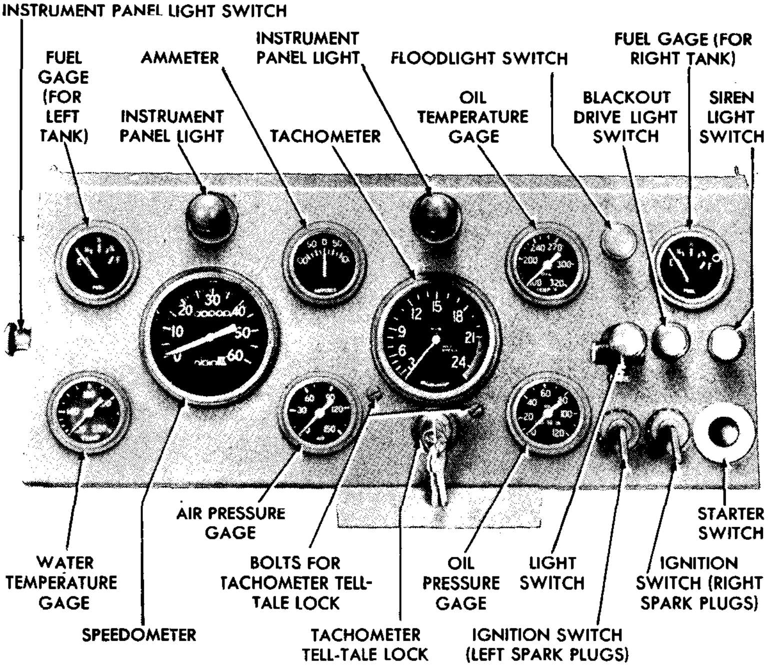
RA PD 77031

***Figure 257—Instrument Panel Assembly—Rear View***

*(b) Installation.* Install gage and fasten with clamp, nuts, and lock washers. Then install wires and fasten with two nuts, plain washers, and lock washers.

(2) SIREN LIGHT FLASHER.

*(a) Removal.* Remove two screws which hold wires to flasher and remove wires. Remove two bolts, nuts, and lock washers that hold flasher to end of instrument panel, and lift off flasher.


INSTRUMENT PANEL LIGHT SWITCH
FUEL GAGE (FOR LEFT TANK)
AMMETER
INSTRUMENT PANEL LIGHT
INSTRUMENT PANEL LIGHT
TACHOMETER
FLOODLIGHT SWITCH
OIL TEMPERATURE GAGE
FUEL GAGE (FOR RIGHT TANK)
BLACKOUT DRIVE LIGHT SWITCH
SIREN LIGHT SWITCH
AIR PRESSURE GAGE
STARTER SWITCH
WATER TEMPERATURE GAGE
BOLTS FOR TACHOMETER TELL-TALE LOCK
OIL PRESSURE GAGE
LIGHT SWITCH
IGNITION SWITCH (RIGHT SPARK PLUGS)
SPEEDOMETER
TACHOMETER TELL-TALE LOCK
IGNITION SWITCH (LEFT SPARK PLUGS)

RA PD 76911

***Figure 258—Instrument Panel Assembly—Front View***

*(b) Installation.* Install flasher on panel and fasten with two bolts, nuts, and lock washers. Install wires and fasten with screws.

(3) OIL TEMPERATURE GAGE.

*(a) Removal.* Remove two nuts and lock washers that hold gage to clamp and remove clamp. Disconnect oil temperature gage cable at oil filter then disconnect cable from three clamps on radiator shell. Disconnect oil pressure flexible hose from oil pipe and pull hose out of rubber grommet in dash. Pull gage and cable out of instrument panel.

*(b) Installation.* Install gage and cable and fasten with clamp and two nuts and lock washers. Thread cable around radiator shell

and fasten with three clamps. Connect cable to oil filter, then push oil pressure flexible hose through rubber grommet in dash and connect hose to oil pipe.

(4) TACHOMETER.

*(a) Removal.* Disconnect cable from tachometer. Remove two wing nuts and lock washers that hold tachometer to clamp and remove clamp. Loosen two bolts which hold tachometer telltale lock and remove tachometer.

*(b) Installation.* Install tachometer, then install clamp and fasten with wing nuts and lock washers. Connect tachometer cable. Tighten bolts that hold tachometer telltale lock.

(5) AMMETER.

*(a) Removal.* Remove nut, plain washer, and lock washer that hold three wires on terminal post; then remove nut, plain washer, and lock washer that hold four wires on terminal post. Remove wires from terminals and then remove insulation washer, nut, and plain washer from each terminal. Remove nuts and washers that hold clamp and remove clamp. Pull ammeter off front of instrument panel. NOTE: *Tag wires so that they can be correctly connected at installation.*

*(b) Installation.* Install ammeter, then install clamp and fasten with nuts and washers. Install plain washers, insulation washers, and nuts on terminal posts; then install wires on posts. Fasten wires with nuts, plain washers and lock washers.

(6) LEFT FUEL TANK GAGE.

*(a) Removal.* Remove two nuts, lock washers, and flat washers from each terminal and pull off wires. Remove two nuts and lock washers that hold clamp to gage. Remove clamp and pull gage from front of instrument panel.

*(b) Installation.* Install gage, then install clamp and fasten with two nuts and lock washers. Install wires on terminals and fasten with nuts, lock washers and flat washers.

(7) SPEEDOMETER.

*(a) Removal.* Disconnect speedometer cable from speedometer. Remove two wing nuts and lock washers from clamp, remove clamp, and pull speedometer off front of instrument panel.

*(b) Installation.* Install speedometer on instrument panel, then install clamp and fasten with two wing nuts and lock washers. Connect speedometer cable.

(8) WATER TEMPERATURE GAGE.

*(a) Removal.* Remove water temperature gage cable from thermostat valve housing at engine. Loosen cable from three clamps on engine top cover and pull cable through opening between radiator and radiator side cover. Remove cable from clamps on dash. Remove two nuts and lock washers that hold clamp to gage, remove clamp, and pull gage and cable off front of instrument panel.

*(b) Installation.* Install gage and cable on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Install cable under clamps on dash, then push cable through opening between radiator and radiator side cover. Secure cable to engine top cover with three clamps and install cable in thermostat valve housing.

(9) AIR PRESSURE GAGE.

*(a) Removal.* Discharge air from air reservoirs by opening valve on bottom of air reservoir. Disconnect air line from gage. Remove two nuts and lock washers that hold clamp to gage, remove clamp and pull gage off front of instrument panel.

*(b) Installation.* Install gage on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Connect air line to gage. Close valve on bottom of air reservoir. Start engine and build air pressure up to at least 60 pounds.

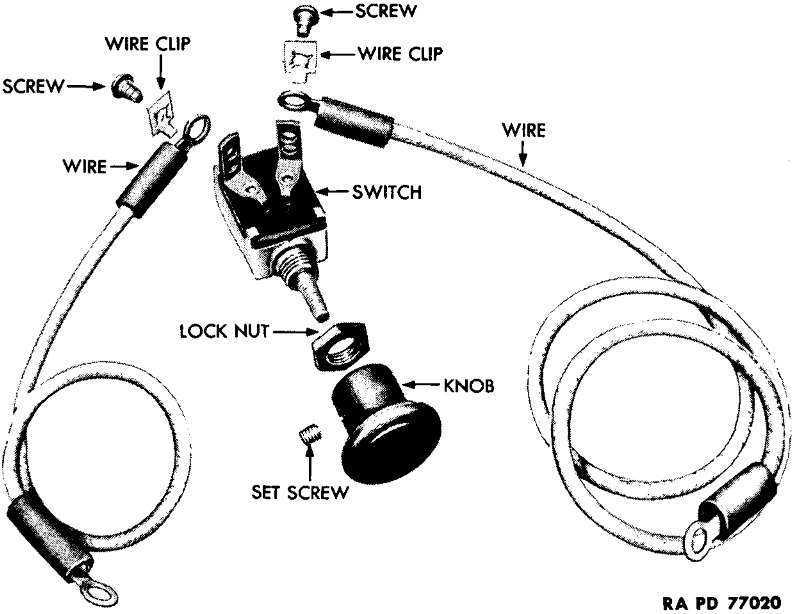


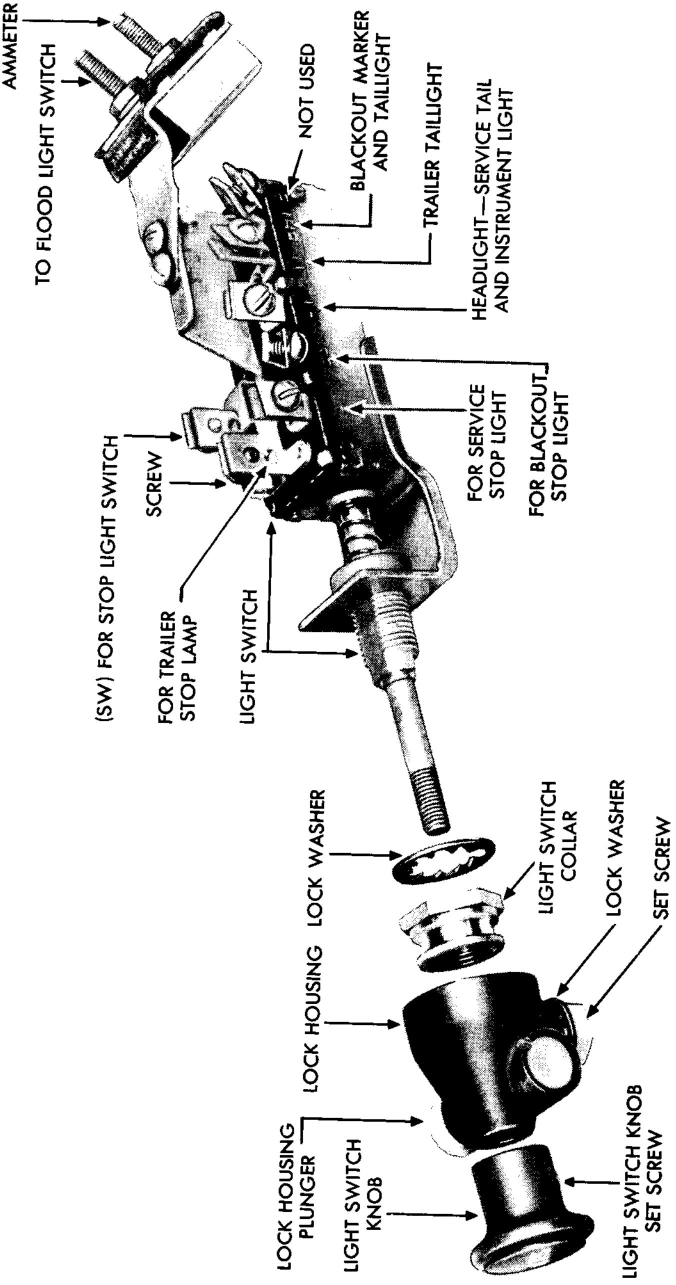
***Figure 259—Siren Light Switch***

(10) OIL PRESSURE GAGE.

*(a) Removal.* Disconnect oil line from gage. Remove two nuts and lock washers that hold clamp to gage, remove clamp and pull gage off front of instrument panel.

*(b) Installation.* Install gage on instrument panel, then install clamp and secure it to gage with two nuts and lock washers. Connect oil line to gage.

(11) INSTALL LEFT WINDSHIELD AND CONNECT BATTERY. Install left windshield (par. 196). Connect battery (par. 127).


AMMETER
TO FLOOD LIGHT SWITCH
(SW) FOR STOP LIGHT SWITCH
SCREW
FOR TRAILER STOP LAMP
LIGHT SWITCH
NOT USED
BLACKOUT MARKER AND TAILLIGHT
TRAILER TAILLIGHT
HEADLIGHT—SERVICE TAIL AND INSTRUMENT LIGHT
FOR SERVICE STOP LIGHT
FOR BLACKOUT STOP LIGHT
LOCK WASHER
LOCK HOUSING
LOCK HOUSING PLUNGER
LIGHT SWITCH KNOB
LIGHT SWITCH COLLAR
LOCK WASHER
SET SCREW
LIGHT SWITCH KNOB SET SCREW

RA PD 47835

*Figure 260—Light Switch*

## 199. SWITCHES.

**a. Description.** The switches used for operation of lights and ignition are located on the instrument panel or adjacent to it.

**b. Replacement.** Before removing any switches, remove windshield (par. 196) and disconnect battery (par. 127).

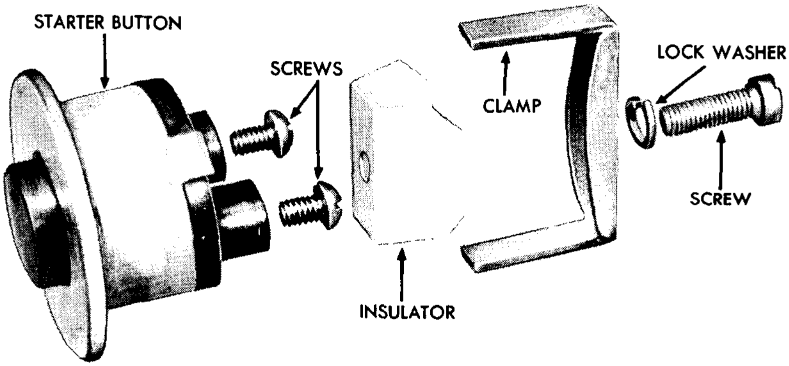
(1) INSTRUMENT LIGHTS.

*(a) Removal.* There are two instrument lights. Pull instrument light hood off instrument panel. Pull socket out of hood and remove from socket.

*(b) Installation.* Install socket in hood and push socket into instrument panel.

(2) IGNITION SWITCHES.

*(a) Removal.* Remove lock nut from front of switch and push switch back into instrument panel so that wiring can be removed. Remove screw and lock washer which holds two wires on terminal, then repeat procedure on other terminal having one wire. Remove switch from inside instrument panel. Remove right ignition switch.



RA PD 77028

***Figure 261—Starter Button***

*(b) Installation.* Install switch and secure wires with screws and lock washers. Install lock nut that holds switch to instrument panel.

(3) FLOODLIGHT SWITCH.

*(a) Removal.* Remove two screws and wire clips that hold two wires on switch. Remove set screw that holds knob on switch and unscrew knob. Remove lock nut that holds switch on instrument panel and remove switch from back of instrument panel.

*(b) Installation.* Install switch and fasten with lock nut. Screw knob on switch and fasten with set screw. Install wires and fasten with wire clips and screws.

## INSTRUMENTS

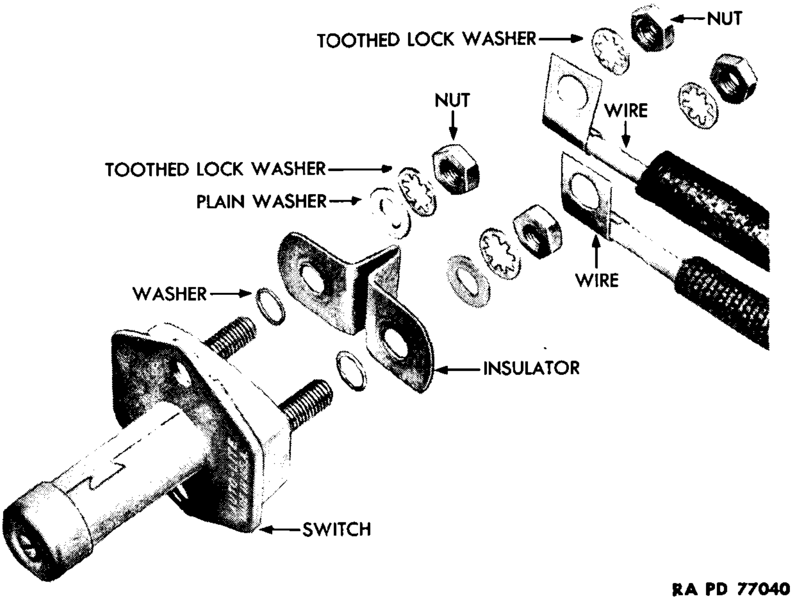
(4) BLACKOUT DRIVING LIGHT SWITCH AND SIREN LIGHT SWITCH.

*(a) Removal.* Remove set screw that holds knob on switch and unscrew knob. Remove lock nut that holds switch on instrument panel and push switch into instrument panel. Remove two screws and wire clips that hold two wires on switch. Remove switch from inside instrument panel.

*(b) Installation.* Install switch and install wires on switch, fastening with two screws and wire clips. Install lock nut that holds switch on instrument panel. Screw knob on switch and fasten with set screw.

(5) MAIN LIGHT SWITCH.

*(a) Removal.* Remove set screw that holds knob on switch and unscrew knob. Loosen set screw that holds lock housing and pull housing off switch. Remove lock nut that holds switch to instrument panel; push switch into instrument panel. Remove two nuts and lock washers that hold two wires to circuit breaker. Remove seven screws and wire clips that hold wires to switch. Remove switch from inside of instrument panel.



RA PD 77040

**Figure 262—Siren Switch**

*(b) Installation.* Install switch inside instrument panel and attach wires to switch with seven screws and wire clips. Install two wires on circuit breaker and fasten with two nuts and lock washers. Install lock nut that holds switch to instrument panel, then install lock

housing on switch and fasten with set screw. Screw knob on switch and fasten with set screw.

(6) TACHOMETER TELLTALE LOCK.

*(a) Removal.* Remove two bolts, nuts, and lock washers that hold lock on instrument panel and remove lock.

*(b) Installation.* Install lock and secure with bolts, nuts, and lock washers.

(7) STARTER BUTTON.

*(a) Removal.* Remove siren light flasher (par. 198), then remove screw and lock washer that holds clamp to button, push button into instrument panel and remove clamp. Remove two screws and wire clips that hold wires to button and remove button from inside instrument panel.

*(b) Installation.* Install button from inside instrument panel and attach wires with wire clips and screws. Push button into place and fasten with clamp, screw, and lock washer. Install siren light flasher.

(8) SIREN SWITCH.

*(a) Removal.* Remove two nuts and star washers that hold wires to switch, and remove wires. Remove nut, toothed lock washer, and plain washer that hold insulator, and remove insulator. Remove two plain washers and switch.

*(b) Installation.* Install switch, two washers, insulator, plain and toothed lock washers, and then fasten with nut. Connect wires and fasten with two nuts and toothed lock washers.

(9) DIMMER SWITCH.

*(a) Removal.* Remove bolt, nut, and lock washer that hold switch to floorboard, then remove three screws and wire clips that hold three wires to switch and remove switch.

*(b) Installation.* Install switch on floorboard and fasten with bolt, nut, and lock washer. Install wires and fasten with wire clips and screws.

(10) INSTRUMENT LIGHT SWITCH.

*(a) Removal.* Remove screws, wire clips, and wires from switch. Remove set screw and unscrew switch knob. Remove lock nut and then remove switch from panel.

*(b) Installation.* Install switch and fasten to instrument panel with lock nut. Screw knob on switch and fasten with set screw. Install wires and fasten with wire clips and screws.

## Section XXXI

# FRONT WINCH

Paragraph

Description and data . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 200
Automatic brake . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 201
Controls and linkage . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 202
Sprockets and chains . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 203
Propeller shaft and double bearing . . . . . . . . . . . . . . . . . . . . . . 204
Removal . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 205
Installation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 206

## 200. DESCRIPTION AND DATA.

**a. Description.** The front mounted winch is secured to the front of the chassis frame and consists of a drum containing ¾-inch cable, an automatic brake, and a worm with worm gear for operating the drum.

**b. Data.**

| | |
|---|---|
| Make | Gar Wood |
| Model | 5M 713K |
| Cable | ¾ in. |
| Length | 300 ft |

## 201. AUTOMATIC BRAKE.

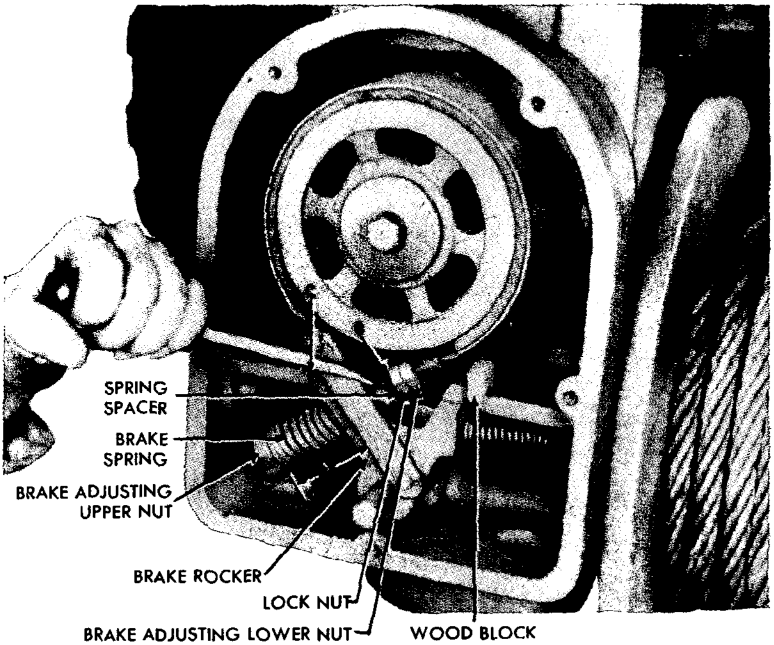
**a. Description.** The automatic brake is secured to the drum shaft and consists of a housing with cover in which the brake drum and band are located. The brake holds the load on the cable to prevent it from being paid out too rapidly. The brake band is adjustable by means of a spring-loaded adjusting screw.

**b. Adjustment.**

(1) ADJUST BRAKE. Remove winch (par. 205), then remove brake case cover. With no load on winch, wedge rocker over with a piece of wood so that rocker holds contact at "O" (fig. 263). Slack off two brake adjusting nuts about ¼ inch and adjust nuts to make length of brake spring in this position 1⅝ inches (dimension "A," fig. 263). Jam first of two brake adjusting nuts against second nut to hold its position. Take up on two adjusting nuts until there is ⅛-inch clearance between spring spacer and first of brake adjusting nuts. Install cover. Install winch (par. 206).

(2) TEST AND READJUST BRAKE. Action of automatic brake is such that brake will automatically apply enough drag to hold a load when engine clutch is disengaged. When winch is reversed by power, brake should allow drum to turn for cable unwinding. Test holding power of brake by hoisting a load. Then start lowering load and disconnect engine clutch. If properly adjusted, brake will stop load from coming down more than 2 inches, and will hold it suspended. If brake does not hold load, remove winch and increase

brake spring tension by removing brake case cover, loosening lock nuts, the first of two top brake adjusting nuts and the second of two lower brake adjusting nuts. Tighten second of brake top adjusting nuts by one-half turn (fig. 263). Tighten lock nut while maintaining location of adjusting nut. With no load on winch, wedge rocker over with piece of wood so that rocker holds contact at "C" (fig. 263). Use screwdriver to hold spring spacer up into rocker as far as it will go. Dimension "B" (fig. 263) which is the space between spring spacer and first of two lower adjusting nuts, should then be about ⅛ inch. Tighten or loosen (whichever is necessary) adjusting nut until dimension "B" is about ⅛ inch. Then maintain location of brake adjusting nut and tighten lock nut against it. Install winch and test under load; if winch does not hold, repeat adjustment and test procedure until it will hold required load.



RA PD 76957

*Figure 263—Checking Adjustment of Automatic Brake*

c. **Removal.** Remove cap screws and lock washers which hold cover on brake case and remove cover. Remove cap screw, lock washer, and retaining washer that hold brake drum, then pry off rocker spring. Pull brake drum with automatic brake band assembly off drum shaft.

d. **Installation.** Install brake drum with automatic brake band assembly on drum shaft. Install rocker spring, then install retaining washer, lock washer, and cap screw that hold brake drum. Adjust brake (subpar. **b**, above). Install cover on brake case and secure with cap screws and lock washers.

## 202. CONTROLS AND LINKAGE.

**a. Description** (figs. 264 and 265). The controls and linkage for the front mounted winch consist of a cross tube with a lever clamped to each end, the lever rod and clevis at the driver's seat, and the power take-off control rod and clevis. The cross tube is secured to the lever rod clevis by the rear lever and to the power take-off control rod clevis by the front lever. The assembly is secured in bearings to the frame.

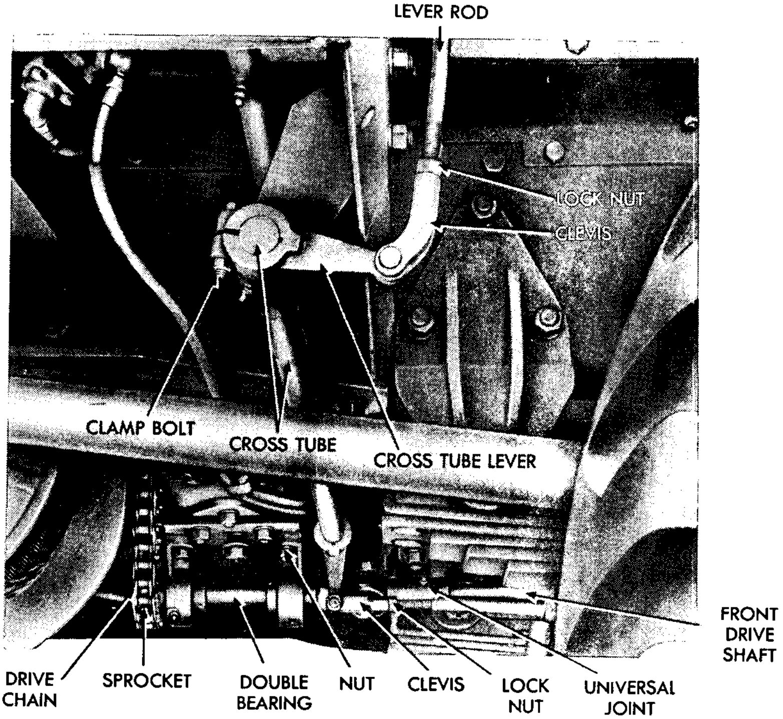

LEVER ROD
LOCK NUT
CLEVIS
CLAMP BOLT
CROSS TUBE
CROSS TUBE LEVER
FRONT DRIVE SHAFT
DRIVE CHAIN
SPROCKET
DOUBLE BEARING
NUT
CLEVIS
LOCK NUT
UNIVERSAL JOINT
RA PD 76988

*Figure 264—Front Winch Control Linkage*

**b. Removal** (figs. 264 and 265). Remove cotter pins and clevis pins that hold control rod to power take-off and to cross tube lever, and remove control rod. Remove clevis pin holding lever rod to cross tube lever. Remove cross tube and levers.

**c. Installation** (figs. 264 and 265). Install cross tube and secure levers to tube. Position control rod to power take-off and to cross tube lever, and fasten with clevis pins and cotter pins. Connect lever rod to cross tube lever and fasten with clevis pin and cotter pin.

## 203. SPROCKETS AND CHAINS.

**a. Description.** The sprockets to drive the front mounted winch are located on the power take-off propeller shaft on the outside of the double bearing and on the winch worm shaft. They are connected by a drive chain. The drive chains are covered in paragraphs 205 and 206.

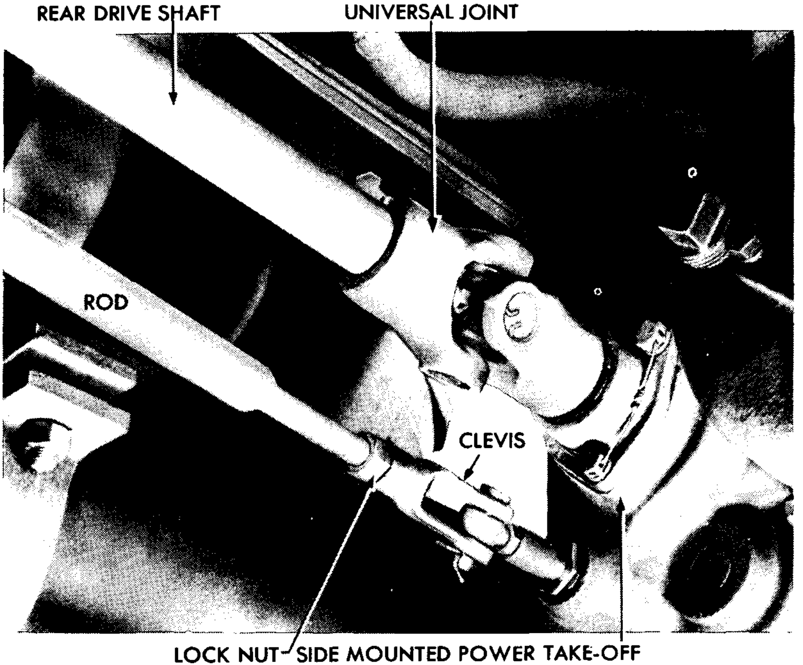


*Figure 265—Front Winch Control Linkage*

**b. Double Bearing Sprocket.**

(1) REMOVAL. Remove drive chain (par. 205). Remove cap screw, lock washer, and retaining washer, and pull off sprocket.

(2) INSTALLATION. Install sprocket, retaining washer, lock washer, and cap screw. Install drive chains (par. 206).

**c. Worm Shaft Sprocket.**

(1) REMOVAL. Remove drive chains (par. 205). Pull sprockets off worm shaft.

(2) INSTALLATION. Install sprocket on key in worm shaft. Install drive chains (par. 206).

## 204. PROPELLER SHAFT AND DOUBLE BEARING.

**a. Description.** The propeller shaft and universal joints are connected to the auxiliary transmission side mounted power take-off at one end by means of a set screw which secures the universal joint to the power take-off shaft. The opposite end of the propeller shaft is mounted in a double bearing which is secured to the chassis frame. The winch drive sprocket is secured to the outer end of the propeller shaft.

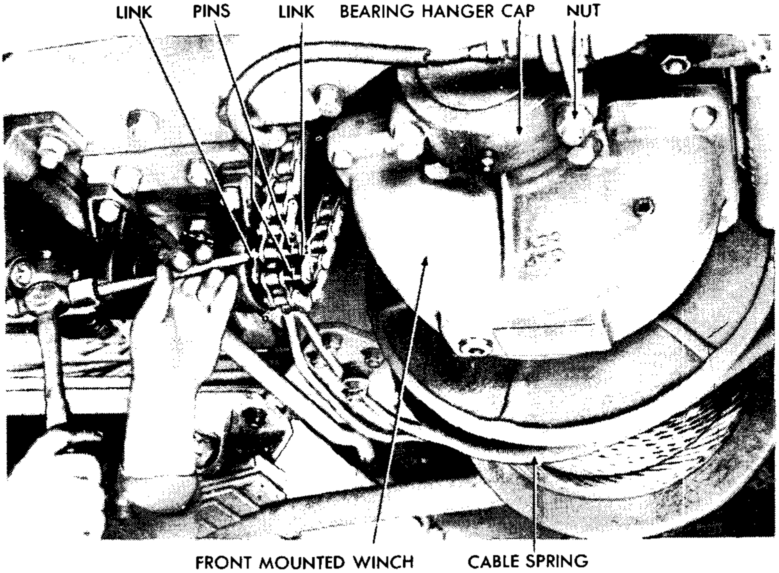


*Figure 266—Disconnecting Winch Chain*

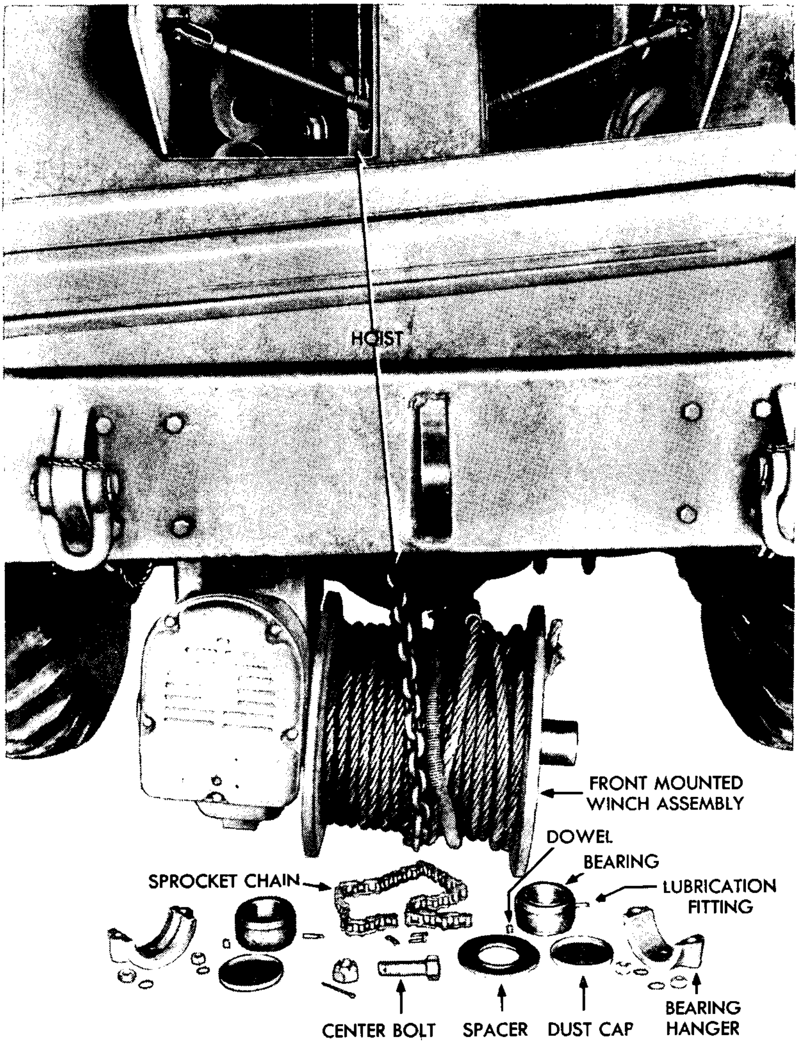
**b. Removal.**

(1) Remove Double Bearing. Remove drive chain (par. 205). Remove four nuts and lock washers that hold double bearing to chassis frame and lower bearing. Remove set screw which holds front section of propeller shaft in universal joint and pull propeller shaft with double bearing out of universal joint. Loosen set screws in double bearing collars and slide bearing off shaft.

(2) Remove Propeller Shaft. Remove four bolts, nuts, and lock washers that hold the two single bearings to frame. Loosen set screws that hold universal joint to power take-off drive shaft, and remove center and rear sections of propeller shaft with the two single bearings.

**c. Installation.**

(1) Install Propeller Shaft. Install center and rear sections of propeller shaft with two single bearings across fuel tank brackets.


HOIST
FRONT MOUNTED WINCH ASSEMBLY
DOWEL
BEARING
LUBRICATION FITTING
SPROCKET CHAIN
CENTER BOLT
SPACER
DUST CAP
BEARING HANGER

RA PD 76892

*Figure 267—Lowering Winch to Ground*

Connect rear universal joint to power take-off drive shaft and secure with set screw. Fasten two single bearings to frame with four bolts, nuts, and lock washers, securing exhaust pipe shield at the same time.

(2) INSTALL DOUBLE BEARING. Slide double bearing and collars onto front section of propeller shaft, and secure collars with set screws. Position double bearing and shaft to frame, sliding end of shaft into universal joint. Tighten universal joint set screw and secure double bearing to frame with four nuts and lock washers. Install drive chain on sprocket (par. 206).

## 205. REMOVAL.

**a. Remove Drive Chain** (fig. 266). Remove two cotter pins from sprocket chain link pins and then drive out pins and remove chain.

**b. Remove Winch** (fig. 267). Unlock cable spring. Remove cotter pin from winch center mounting bolt nut by reaching through radiator door, then remove bolt and nut. Attach hoist to winch. Remove four nuts and lock washers that hold winch to bearing hanger, then remove two bearing hanger caps. Lower winch about eight inches and remove two bearing hanger dowels. Remove dust cap and bearing from right end of drum shaft and remove dust cap, bearing, and spacer from left end of drum shaft. Lower winch to ground. NOTE: *Cable clamp must be in such a position that it will not interfere with bearing hanger.*

## 206. INSTALLATION.

**a. Install Front Mounted Winch** (fig. 267). Raise winch until ready to install in place, and install dust cap and bearing on right end of drum shaft. Then install dust cap, bearing, and spacer on left end of drum shaft. Grease two bearing hanger dowels and install in bearing hanger. Raise winch until one side touches dowel, guide bearing onto dowel by inserting steel bar through lubrication fitting hole. Repeat procedure on opposite side. Make certain bearings are on dowels by trying bearing with steel bar; bearing will not turn if it is on dowel. Install bearing caps on same side they were removed from, and fasten with four nuts and lock washers. Install lubrication fitting in bearings. Remove hoist from winch and pull winch back to frame, then install winch center mounting bolt, nut, and cotter pin by reaching through radiator door.

**b. Install Drive Chain** (fig. 266). Install chain on winch sprocket and on drive sprocket, and install sprocket chain link pins and cotter pins. Connect cable spring.

## Section XXXII

# TANDEM REAR WINCHES

Paragraph

Description and data ........ 207
Cables ........ 208
Chains and chain tighteners ........ 209
Sprockets ........ 210
Double bearing ........ 211
Controls and linkage ........ 212
Removal of tandem rear winch ........ 213
Installation of tandem rear winch ........ 214

## 207. DESCRIPTION AND DATA.

**a. Description** (fig. 268).

(1) The tandem winch assembly consists of a front winch and a rear winch which are mounted together on a winch base which is secured to the chassis frame, at the rear of the cab. A platform is provided for the winch operator. A power take-off control lever, mounted on the left side of the tandem winch assembly, is provided to shift power take-off gears to obtain neutral, low, and high speeds for the front and rear tandem winches. A winch hand clutch lever, hand brake lever, and operating lever are provided for each of the two winches and are mounted on the left side of the winch rear base angle. A throttle control lever, mounted on the left side of the tandem rear winch, provides engine throttle control from the winch platform. An engine clutch control foot lever is provided at the rear of the platform to disengage the engine clutch when shifting the power take-off winch control lever.

(2) The wrap type safety brakes used on the tandem front and rear mounted winches are the same as those used on the vehicle front mounted winch. Brake replacement and adjustments are made in the same manner (par. 201), except that it is not necessary to remove either winch to take off brake housing covers.

**b. Data.**

| | |
|---|---|
| Make | Gar Wood |
| Model | 60-823B |

## 208. CABLES.

**a. Description.** Each of the tandem winches and the front mounted winch carries 300 feet of cable for retrieving purposes. Each cable is secured to the winch drum at one end and carries a hook at the free end. NOTE: *The maintenance, removal, and installation of a cable is the same on all winches.*

**b. Maintenance.** Cable must be kept lubricated with engine oil. Unwind cable, then saturate a rag with oil and as cable is wound

## TANDEM REAR WINCHES

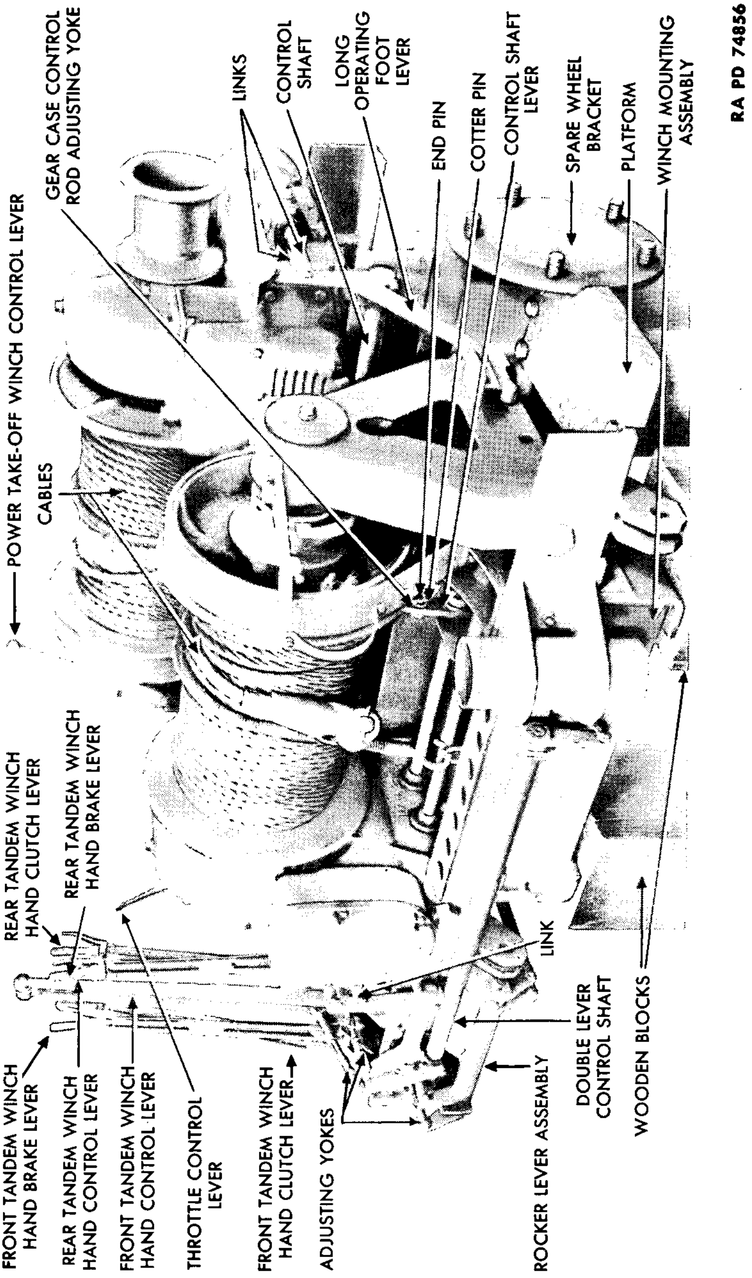

GEAR CASE CONTROL ROD ADJUSTING YOKE
POWER TAKE-OFF WINCH CONTROL LEVER
CABLES
LINKS
CONTROL SHAFT
LONG OPERATING FOOT LEVER
END PIN
COTTER PIN
CONTROL SHAFT LEVER
SPARE WHEEL BRACKET
PLATFORM
WINCH MOUNTING ASSEMBLY
RA PD 74856
REAR TANDEM WINCH HAND CLUTCH LEVER
REAR TANDEM WINCH HAND BRAKE LEVER
FRONT TANDEM WINCH HAND BRAKE LEVER
REAR TANDEM WINCH HAND CONTROL LEVER
FRONT TANDEM WINCH HAND CONTROL LEVER
THROTTLE CONTROL LEVER
FRONT TANDEM WINCH HAND CLUTCH LEVER
ADJUSTING YOKES
ROCKER LEVER ASSEMBLY
LINK
DOUBLE LEVER CONTROL SHAFT
WOODEN BLOCKS

***Figure 268—Tandem Winch Assembly—Rear View***

onto drum, coat cable with oil. Cable must be wound on the drum in even layers and during the winding, the cable must be under tension so that it is tightly wrapped. The coil spring, used to hold end of cable on drum, must always be used to prevent cable loosening and cable end from dragging.

c. **Removal.** Disconnect spring, then start engine and place control lever in low. Unspool cable for about 15 feet and attach to another drum or lay where cable is out of dirt. If cable is being wound on a drum, guide cable with a steel bar so that it lays in even layers and does not kink. Stop engine and shift control lever to neutral. Remove cable clamp screws and clamp to release end of cable.

d. **Installation.** Insert end of cable under cable clamp and fasten clamp with cap screws. Anchor opposite end of cable securely so that a tension is maintained on the cable. Start engine and place control lever in low. Use a clean paint brush (or cloth) and engine oil, and coat cable as it is being wound. Guide cable onto drum with a steel bar held by two men, being careful not to kink cable or cross layers. When cable is completely on drum, stop engine, place control lever in neutral and attach spring to cable.

## 209. CHAINS AND CHAIN TIGHTENERS.

a. **Description.** There are three chains used to drive the rear tandem winches and these are: tandem drive line to layshaft chain, layshaft to tandem rear winch chain, and layshaft to tandem front winch chain. The two chain tighteners are idler sprockets, which are adjustable for removing slack from winch worm drive chains.

b. **Chain Adjustment.**

(1) DRIVE LINE TO LAYSHAFT CHAIN. The tandem drive line to layshaft chain is adjusted by installing shims under the single bearings to slacken chain and by removing shims to tighten chain. When a rule is placed perpendicular to the center of one side of the installed chain, play should not exceed ¼ inch.

(2) LAYSHAFT TO WINCH CHAINS. Layshaft to rear tandem winch chain and layshaft to front tandem winch chain are adjusted by loosening the chain tightener assembly bolts and sliding the assembly back, or forward, as required to attain desired tightness. Bolts should then be tightened. When a rule is placed perpendicular to the center of the top of the chain between sprockets, play should not exceed one inch.

c. **Remove Chains.** Remove two cotter pins from two link pins which join links and remove link which is on cotter pin end of link pins. Drive the two pins and opposite link out of chain and remove chain.

d. **Install Chains.** Install chain and join ends by driving two pins and link through chain. Install link on the two pins and insert cotter pins in link pins.

e. **Remove Chain Tighteners.** Remove chain tightener assembly from front winch base rear angle by removing four bolts, nuts, and lock washers which secure chain tightener bracket to base angle. Remove remaining chain tightener assembly by removing two bolts, nuts, and lock washers which secure each clamp to base front angle and base rear angle.

**f. Install Chain Tighteners.** Install chain tightener assembly on rear winch base and secure it with four bolts, nuts, and lock washers. Install remaining chain tightener assembly under two base angles with two clamps in position over bar. Secure clamps with four bolts, nuts, and lock washers.

## 210. SPROCKETS.

**a. Description.** Drive chain sprockets are secured to the input shafts of the front and rear winches of the rear tandem winch assembly and to the layshaft, chain tighteners, double bearing, and worm shafts.

**b. Chain Tightener Sprocket.**

(1) REMOVAL. Remove nut, lock washer, and flat washer from bearing pin. Remove set screw on bracket and pull sprocket assembly and spacer from bearing pin. Remove six screws, which secure inner and outer bearing covers to sprocket, and remove covers, felt seals, and gaskets. Remove felt oil seals from covers and press ball bearing from sprocket.

(2) INSTALLATION. Coat ball bearing with engine oil and press bearing into sprocket. Install new felt seals in inner and outer covers. Install new gaskets and secure covers on sprockets with six screws. Install spacer and sprocket on bearing pin and install set screw on bracket. Install flat washer, lock washer, and nut on bearing pin.

**c. Input Shaft Sprocket.**

(1) REMOVAL. Remove drive chains (par. 209). Remove cap screw, lock washer, and retaining washer from end of input shaft and pull sprocket from shaft.

(2) INSTALLATION. Install sprocket on key in input shaft and secure it with retaining washer, lock washer, and cap screw. Install drive chains (par. 209).

**d. Worm Shaft Sprockets.**

(1) REMOVAL. Remove drive chains (par. 209). Pull sprocket off shaft.

(2) INSTALLATION. Install sprocket on key in worm shaft and then install drive chain (par. 209).

**e. Double Bearing Sprockets.**

(1) REMOVAL. Remove drive chains (par. 209). Remove cap screw, lock washer, and retaining washer from end of bearing shaft and remove sprocket.

(2) INSTALLATION. Install sprocket on bearing shaft, then install retaining washer, lock washer, and cap screw. Install drive chain (par. 209).

## 211. DOUBLE BEARING.

**a. Description** (fig. 269). The double bearing consists of a housing which is secured to the chassis frame, and contains two ball bearings in which the tandem front winch propeller shaft rotates.

**b. Removal.** Remove drive chain (par. 209). Disconnect universal joint. Remove four bolts, nuts, and lock washers which hold double bearing to chassis frame. Remove double bearing assembly and six shims. Remove cap screw, lock washer and retaining washer from end of bearing shaft and remove sprocket. Remove four cap screws and lock washers which hold each of two oil seal caps to bearing housing, and remove caps and gaskets. Press shaft out of housing, carrying one ball bearing with it and leaving opposite bearing in housing. Remove bearing spacer from end of shaft and pull off ball bearing. Drive remaining ball bearing out of housing.

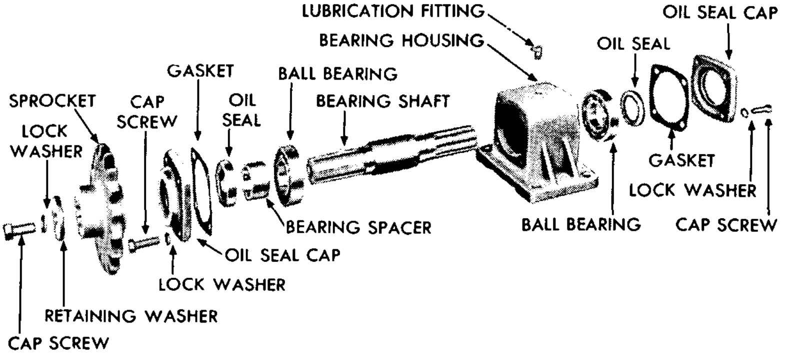

LUBRICATION FITTING
BEARING HOUSING
OIL SEAL CAP
OIL SEAL
GASKET
BALL BEARING
SPROCKET
CAP SCREW
OIL SEAL
BEARING SHAFT
LOCK WASHER
GASKET
LOCK WASHER
BEARING SPACER
BALL BEARING
CAP SCREW
OIL SEAL CAP
LOCK WASHER
RETAINING WASHER
CAP SCREW
RA PD 74936

*Figure 269—Double Bearing and Shaft—Disassembled*

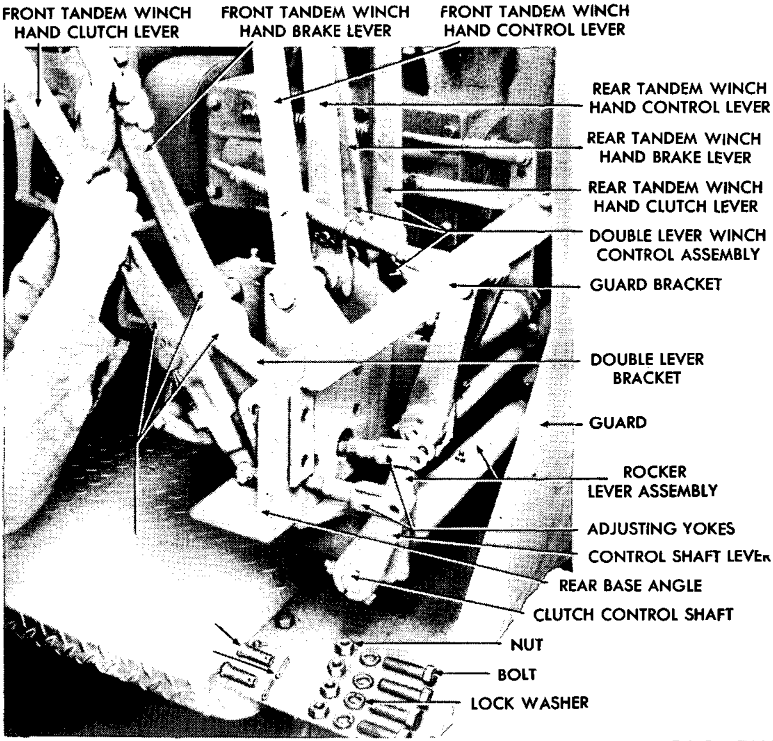
**c. Installation.** Press one ball bearing on bearing shaft, then install shaft and bearing in bearing housing and press ball bearing into position in housing. Press remaining ball bearing on opposite end of shaft and into bearing housing. Install bearing spacer on shaft next to ball bearing just installed. Install new oil seal in each oil seal cap. Install new end cover gasket between each cover and bearing housing and secure each cover to housing with four cap screws and lock washers. Install sprocket on shaft and then install retaining washer, securing it to end of shaft with cap screw and lock washer. Connect universal joint and install drive chain.

## 212. CONTROLS AND LINKAGE.

**a. Description.** The controls and linkage consist of the control levers for each winch, and the controls for the engine clutch and throttle. These controls are secured to the winch base close to the operator's platform and are connected to the units they operate by rod or cable linkage.

## TANDEM REAR WINCHES

**b. Adjustment.** Operate the tandem winch assembly in a recovery operation. If any of the control levers do not operate quickly and easily, adjust the linkage by removing cotter and clevis pin and turning clevis on, or off, the rod. Then test again in a recovery operation. The control levers must return to neutral when released, and to insure this neutral position, the centering springs must be adjusted by means of the rod nuts. CAUTION: *Centering springs not adjusted correctly will throw the control lever too far and momentarily engage the opposite clutch, thus starting movement in the opposite direction.*

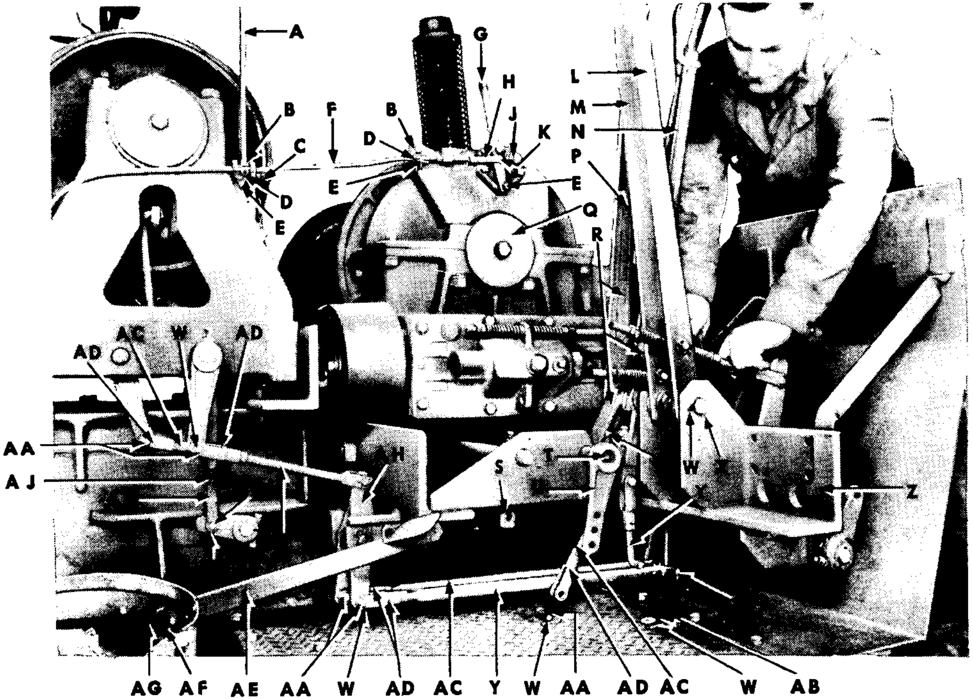

FRONT TANDEM WINCH HAND CLUTCH LEVER
FRONT TANDEM WINCH HAND BRAKE LEVER
FRONT TANDEM WINCH HAND CONTROL LEVER
REAR TANDEM WINCH HAND CONTROL LEVER
REAR TANDEM WINCH HAND BRAKE LEVER
REAR TANDEM WINCH HAND CLUTCH LEVER
DOUBLE LEVER WINCH CONTROL ASSEMBLY
GUARD BRACKET
DOUBLE LEVER BRACKET
GUARD
ROCKER LEVER ASSEMBLY
ADJUSTING YOKES
CONTROL SHAFT LEVER
REAR BASE ANGLE
CLUTCH CONTROL SHAFT
NUT
BOLT
LOCK WASHER

RA PD 76894

*Figure 270—Removal of Front Tandem Winch Hand Clutch and Brake Levers*

**c. Removal** (figs. 270 and 271).

(1) REMOVE DOUBLE LEVER WINCH CONTROL ASSEMBLY (includes the tandem front winch hand brake and clutch levers). Remove two end pins and two cotter pins which hold brake and clutch adjusting yokes to control lever and to rocker lever assembly at rear of winch rear base angle. Then remove four nuts, bolts, and


A
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AC
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AB

RA PD 76956

Figure 271—Removal of Rear Tandem Winch Hand Brake and Clutch Levers

A—POWER TAKE-OFF WINCH CONTROL LEVER
B—CLIP
C—BRACKET PIN
D—BRACKET
E—NUT
F—THROTTLE CONTROL CABLE AND TUBING
G—THROTTLE CONTROL LEVER
H—YOKE
J—QUADRANT
K—PIN
L—FRONT TANDEM WINCH HAND CONTROL LEVER
M—REAR TANDEM WINCH HAND CONTROL LEVER
N—REAR TANDEM WINCH HAND BRAKE LEVER
P—REAR TANDEM WINCH HAND CLUTCH LEVER
Q—REAR TANDEM WINCH
R—DOUBLE LEVER WINCH CONTROL ASSEMBLY
S—CLUTCH CONTROL LEVER

T—BRAKE CONTROL SHAFT
U—BRAKE CONTROL LEVER
V—SET SCREW
W—COTTER PIN
X—HAND LEVER PIN
Y—BRAKE CONTROL ROD
Z—REAR BASE ANGLE
AA—END PIN
AB—FLAT WASHER
AC—CLUTCH CONTROL ROD
AD—ADJUSTING YOKE
AE—ENGINE CLUTCH CONTROL FOOT LEVER
AF—ENGINE CLUTCH CONTROL SHAFT
AG—CLAMP BOLT (NOT SEEN)
AH—ROCKER LEVER
AJ—POWER TAKE-OFF
WINCH CONTROL ROD

RA PD 76956A

***Legend for Figure 271—Removal of Rear Tandem Winch Hand Brake and Clutch Levers***

lock washers which hold double lever bracket to winch rear base angle. Lift front tandem winch double lever winch control assembly from vehicle (fig. 270).

(2) REMOVE TANDEM REAR WINCH HAND CLUTCH AND BRAKE LEVERS. Loosen set screw at top of rear winch brake control lever and remove cotter pin and flat washer which hold brake control rod to control lever. Then tap brake control lever partly off the control shaft so brake control rod can be pulled from brake control lever. Remove cotter pin and end pin which secure adjusting yoke at front end of clutch control rod to clutch control lever. Disconnect brake control lever from adjusting yoke at front end of brake control rod in the same manner. Then remove four bolts, nuts, and lock washers which secure double lever bracket to winch rear base angle, and lift two levers with bracket and double lever winch control from angle.

(3) REMOVE FRONT AND REAR TANDEM WINCH HAND CONTROL LEVERS. Remove two pins and end pin which hold adjusting yokes at rear of operating rods to operating levers. Then loosen two set screws on two collars between hand control levers. Remove cotter pin from one end of brake lever pin and drive lever pin from levers and winch rear base angle. Remove two hand control lever assemblies and two collars.

(4) REMOVE TANDEM FRONT WINCH LONG OPERATING FOOT LEVER (fig. 270). Remove two cotter pins and end pins which hold lever to adjusting yoke and to shaft rod link. Then loosen clamp bolt nut and pull off lever. Remove engine clutch-control foot lever at left side of tandem front winch by loosening nut and clamp bolt and pulling lever from engine clutch control shaft. Remove Woodruff key.

(5) REMOVE TANDEM REAR WINCH BRAKE AND CLUTCH CONTROL RODS (fig. 271). Remove cotter pin and end pin from adjusting yoke and lever at front end of each rod. Remove two rods. Remove short control rods by removing cotter pin and end pin from each end of each rod and its connecting control levers.

(6) REMOVE THROTTLE CONTROL LEVER (fig. 271). Remove nut and flat washer which hold lever to quadrant and remove end pin and cotter pin from yoke which holds cable to lever. Remove lever.

(7) REMOVE THROTTLE CONTROL CABLE AND TUBING (fig. 271). Remove two slotted screws and nuts which hold each of the two clips to brackets on winch. Then remove one clip at left front of winch by removing a bolt, nut, and lock washer. In similar manner, remove clip which secures tubing to transmission side of left rear seat support. Remove two slotted screws and nuts which hold clip and tubing to bracket on air cleaner pipe at rear of carburetor. Disconnect cable from carburetor by removing bolt, nut, and lock washer which secure cable chain to carburetor.

(8) REMOVE POWER TAKE-OFF WINCH CONTROL LEVER AND ROD (fig. 271). Remove lock pin from lever. Remove two cotter pins and end pins, which secure lever to bracket and control rod, and remove control lever. Remove cotter pin and end pin, which secure adjusting

yoke at lower end of power take-off winch control rod to control shaft lever, and remove rod.

**d. Installation.**

(1) INSTALL WINCH ENGINE CLUTCH CONTROL FOOT LEVER (fig. 271). Install lever on shaft and tighten clamp bolt nut.

(2) INSTALL TANDEM FRONT WINCH LONG OPERATING FOOT LEVER. Position lever on shaft on right side of tandem front winch and tighten clamp bolt nut. Install two end pins and cotter pins which secure lever to adjusting yoke and to shift rod links.

(3) INSTALL POWER TAKE-OFF WINCH CONTROL LEVER AND ROD (fig. 271). Secure control rod to control shaft lever by installing end pin through adjusting yoke and lever. Lock pin with a cotter pin. Then position control lever on bracket and control rod and install two end pins and cotter pins. Install lock pin in lever.

(4) INSTALL THROTTLE CONTROL CABLE AND TUBING (fig. 271). Position throttle control cable and tubing under rear of cab at left side of tandem winch assembly, placing cable along frame and to left side of engine. Install bolt, nut, and lock washer which secure cable chain to carburetor. Install two slotted screws and nuts, which hold clip and tubing to bracket on air cleaner pipe at rear of carburetor. Then install clip which secures tubing to transmission side of left rear seat support, securing clip to its bracket with two slotted screws and nuts. In a similar way, install two clips and tubing to brackets on winch.

(5) INSTALL THROTTLE CONTROL LEVER (fig. 271). Position lever on quadrant and install nut and flat washer which hold lever to quadrant. Install end pin and cotter pin which secure yoke at end of throttle control cable to lever.

(6) INSTALL TANDEM REAR WINCH BRAKE AND CLUTCH CONTROL RODS (fig. 271). Install short control rods to their connecting levers by installing an end pin and cotter pin to hold each end of each rod to its connecting control levers. Connect long brake and clutch control rods to adjusting yokes by installing end pins and cotter pins through yoke and rod at front end of each rod.

(7) INSTALL CONTROL LEVERS (figs. 270 and 271).

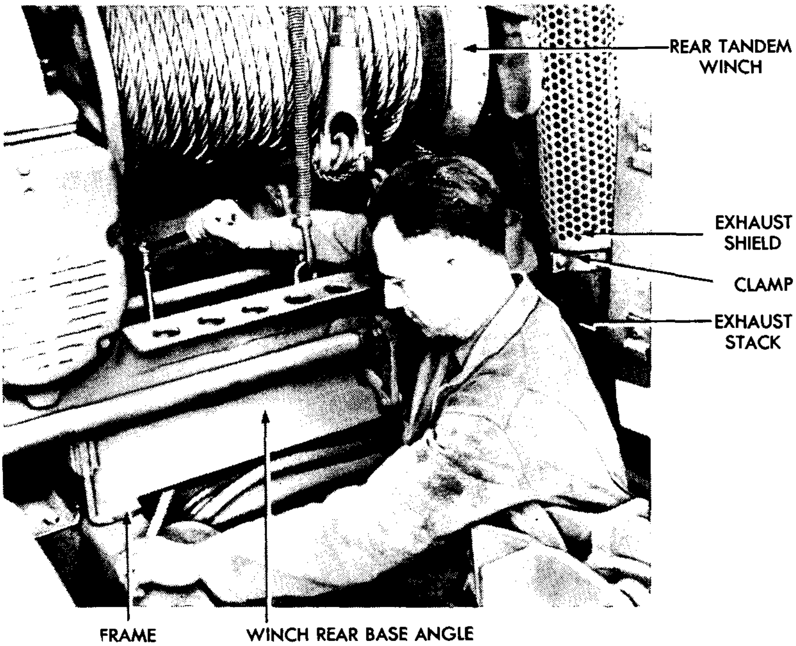
*(a) Install Lever Pin.* Install lever pin through winch rear base angle, two collars, and levers. Lock ends of lever pin with cotter pins. Position two collars next to levers and tighten set screws in collars. Secure adjusting yokes at rear of long control rods to operating levers by installing two end pins and cotter pins.

*(b) Install Hand Clutch and Brake Levers.* Install rear tandem winch hand clutch and brake levers, which are positioned next to rear winch. Lift two levers, with bracket attached, into position on winch rear base angle, and secure bracket to angle with four bolts, nuts, and lock washers.

*(c) Install Brake Control Rod.* Install end and cotter pins which secure yoke at front end of clutch control rod to clutch operating lever. Install brake control rod in brake control lever (in same hole in which it was originally installed) and lock rod with a cotter pin.

Tap brake control lever back into position on shaft and tighten set screw at top of control lever.

*(d) Connect Brake and Clutch Control Rods.* Install front tandem winch hand brake and clutch levers (with double lever bracket attached) on winch rear base angle. Install four nuts, bolts, and lock washers which secure bracket to angle. Install two end pins and cotter pins which hold brake and clutch control rods at bottom of control levers to control rocker levers at rear of winch base angle.



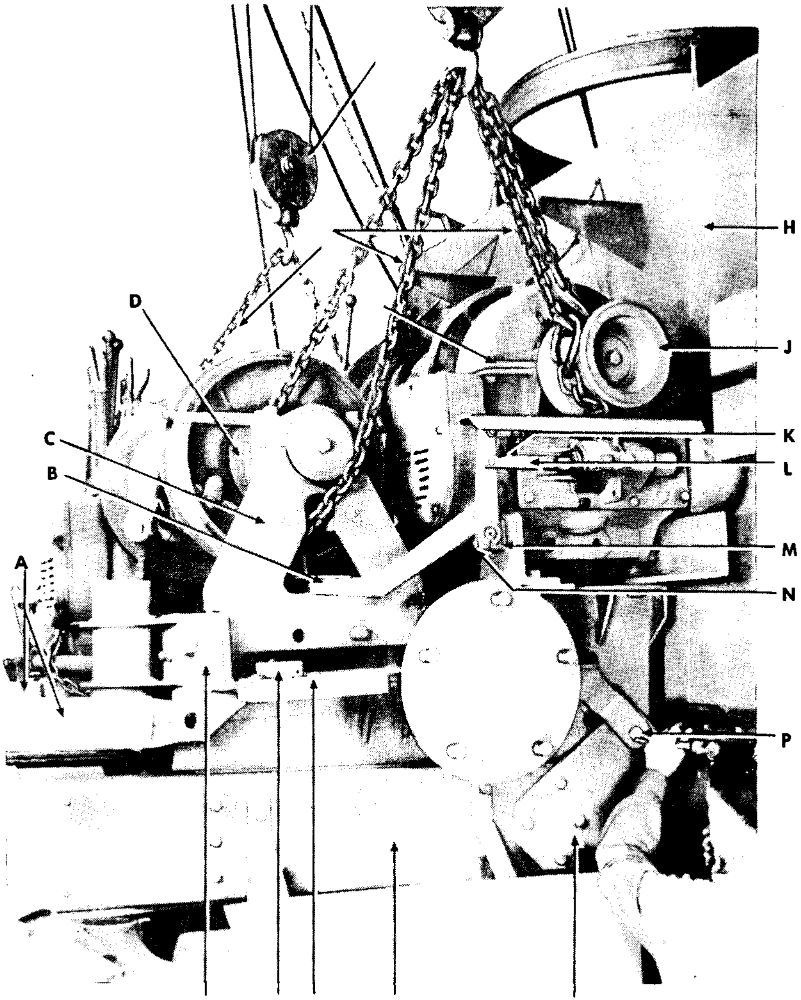
RA PD 76906

*Figure 272—Removal of Tandem Winch Rear Mounting Bolts*

## 213. REMOVAL OF TANDEM REAR WINCH.

**a. Remove Tandem Winch Guard.** From left side of the vehicle, remove two oxygen bottles and one acetylene bottle. Open door of stowage box on left side of vehicle so as to provide access to nuts and remove four bolts, nuts, and lock washers which secure guard to rear of stowage box, and three bolts, nuts, and lock washers which secure guard to top of box. Remove four bolts, nuts, and lock washers which secure guard brackets to winch rear base angle. Lift winch guard from vehicle.

**b. Remove Throttle Control Cable and Tubing.** Remove cotter and rod end pins which secure end yoke to throttle control hand lever. Remove two slotted head screws and nuts, which hold rear clip over cable and tubing to rear bracket. Disconnect cable and



| | |
|---|---|
| A—VERTICAL LIFTING DEVICE | K—PINS |
| B—FRONT TANDEM WINCH LONG OPERATING FOOT LEVER | L—LINK |
| C—END BEARING FRAME | M—CLAMP BOLT |
| D—REAR TANDEM WINCH | N—NUT |
| E—CHAIN SLINGS | P—MOUNTING HINGE PIN |
| F—HOISTS | Q—WINCH SUPPORT PLATE |
| G—FRONT TANDEM WINCH | R—FRAME |
| H—CAB | S—COTTER PIN |
| J—HEAD | T—HINGE PIN |
| | U—REAR BASE ANGLE |

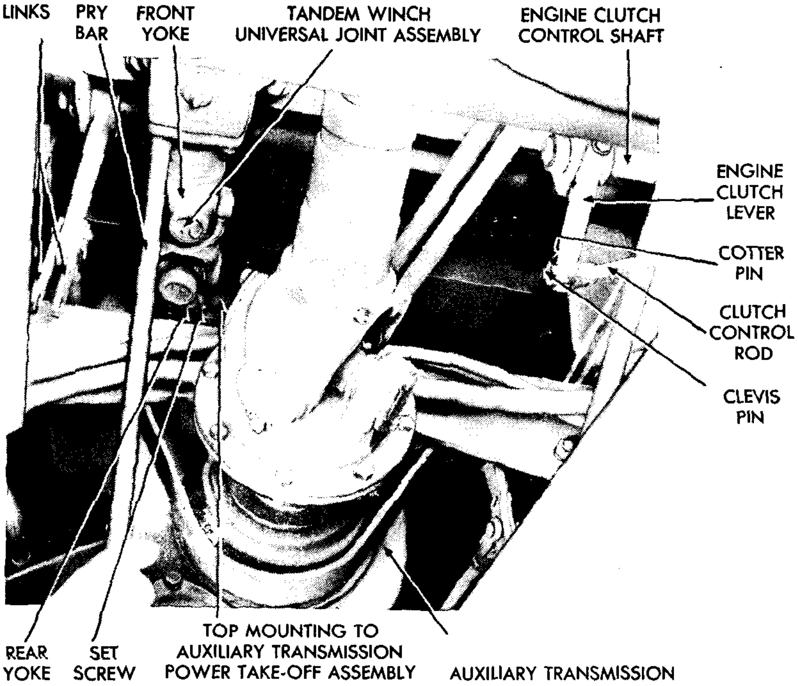
RA PD 76902

*Figure 273—Driving Mounting Hinge Pin from Frame Winch Support Plate*

tubing from front bracket in the same manner. Pull cable and tubing to left and remove.

c. **Remove Spare Tire and Wheel.** Remove spare tire and wheel from right side of vehicle.

d. **Remove Floodlights.** Remove nut, washer, and spring which hold each floodlight to bracket at top rear of cab. Then remove cable plugs from each light and lift lights from brackets.

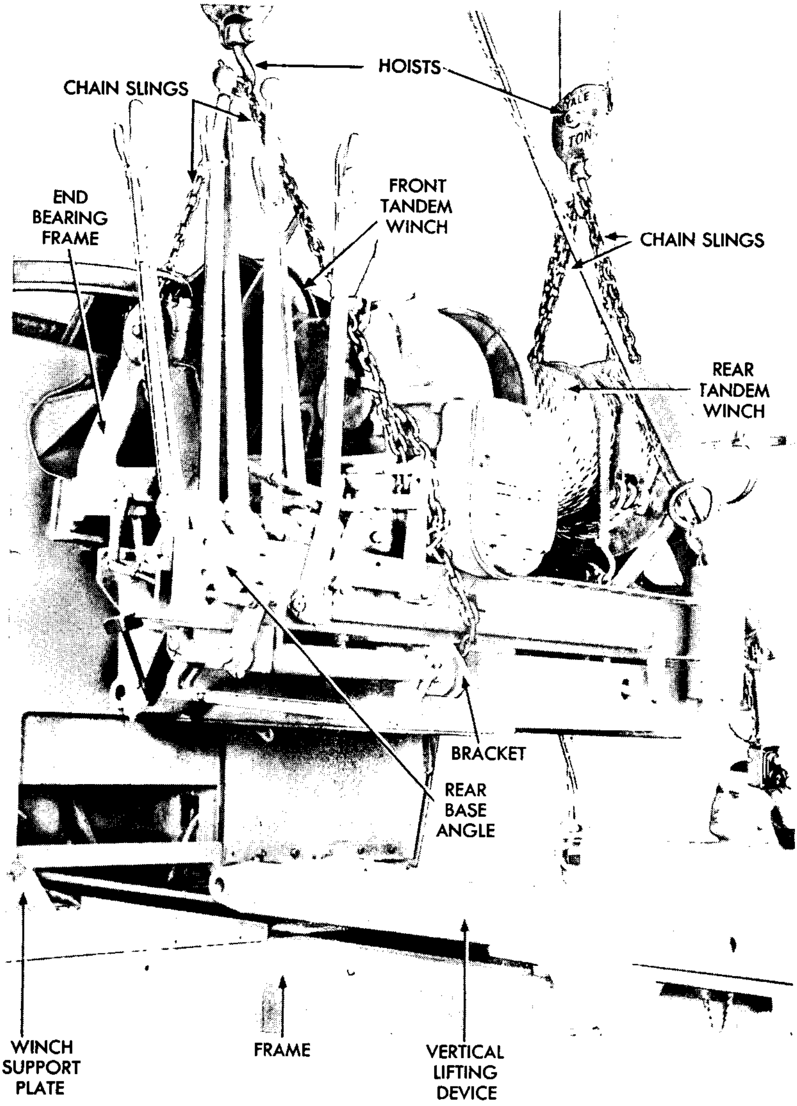

LINKS
PRY BAR
FRONT YOKE
TANDEM WINCH UNIVERSAL JOINT ASSEMBLY
ENGINE CLUTCH CONTROL SHAFT
ENGINE CLUTCH LEVER
COTTER PIN
CLUTCH CONTROL ROD
CLEVIS PIN
REAR YOKE
SET SCREW
TOP MOUNTING TO AUXILIARY TRANSMISSION POWER TAKE-OFF ASSEMBLY
AUXILIARY TRANSMISSION

RA PD 76917

*Figure 274—Positioning Tandem Winch Universal Joint Assembly for Removal of Winch Assembly*

e. **Remove Rear Mounting Bolts** (fig. 272). Remove platform plate which is immediately back of tandem winch assembly by loosening four cap screws so that clips which secure plate to frame can be freed from frame. Lift plate out of the way to provide access to mounting bolts. Then remove two bolts, two springs, and four flat washers which secure winch rear base angle to frame cross member.

f. **Remove Exhaust Stack and Shield.** Remove one bolt, nut, and lock washer which hold top clamp to shield. Remove two bolts, nuts, and lock washers which secure bottom of stack to exhaust pipe. Lift stack and shield from exhaust pipe.


HOISTS
CHAIN SLINGS
END BEARING FRAME
FRONT TANDEM WINCH
CHAIN SLINGS
REAR TANDEM WINCH
BRACKET
REAR BASE ANGLE
WINCH SUPPORT PLATE
FRAME
VERTICAL LIFTING DEVICE

RA PD 76907

*Figure 275—Removal of Tandem Winch Assembly*

**g. Disconnect Vertical Lifting Device** (fig. 273). From each side of front end of vertical lifting device, remove cotter pin and vertical lift hinge pin, which secure vertical lifting device to winch rear base angle.

**h. Attach Hoists to Tandem Winch Assembly** (figs. 273 and 275). Two hoists are require to lift tandem winch assembly and should be used at this point to remove weight of assembly from mounting hinge pins before pins are removed. On the left side of assembly, attach one chain sling around winch rear base angle, at right of vertical lifting device bracket, and then run chain over hoist hook and down through tandem front winch end bearing frame. On right side of tandem winch assembly, place one end of a chain sling through tandem winch end bearing frame, and place chain over second hoist hook and around front tandem winch head.

**i. Remove Mounting Hinge Pins** (fig. 273). Support weight of tandem winch assembly on hoists, sufficiently to remove load from two mounting hinge pins, which secure tandem winch assembly to winch support plate on each side of frame. Then remove cotter pin from end of each hinge pin and drive out pins.

**j. Disconnect Links from Power Take-off Gearshift Rod** (fig. 274). From underneath vehicle, remove cotter pin and end pin which secure the two links to top mounted power take-off gearshift rod.

**k. Loosen Universal Joint Assembly** (fig. 274). Loosen set screw which secures rear yoke to top mounting auxiliary transmission power take-off assembly. Then pry front yoke as far back toward power take-off assembly as possible.

**l. Disconnect Engine Clutch Lever from Clutch Control Rod** (fig. 274). Remove cotter pin and clevis pin which secure clevis yoke at end of engine clutch control rod to clutch lever.

**m. Remove Tandem Winch Assembly** (fig. 275). Using two hoists, lift tandem winch assembly straight up, lifting it slowly and guiding it carefully out of frame. Lift assembly onto wooden blocks, exercising caution to make sure it is not resting on parts which might become damaged.

## 214. INSTALLATION OF TANDEM REAR WINCH.

**a. Lift Tandem Winch Assembly into Position on Frame** (fig. 275). Attach two chain slings and two hoists to assembly. Lift assembly directly over its position on frame and lower it carefully, inserting rear yoke of universal joint assembly into position on splined end of bearing shaft. Then tighten set screw which secures rear universal joint yoke to power take-off (fig. 274).

**b. Install Mounting Hinge Pins** (fig. 273). Support the weight of tandem winch assembly on the two hoists and install two mounting hinge pins through frame winch support plates and winch base. Drive pins into position and lock them with cotter pins.

**c. Connect Power Take-off and Engine Clutch Controls** (fig. 274). From underneath vehicle, position two links on power take-off gearshift rod and secure links to rod by installing link pin and cotter pin. Connect engine clutch lever to clutch control rod by installing clevis pin through clevis yoke and lever. Lock clevis pin with a cotter pin.

d. **Connect Vertical Lifting Device** (fig. 273). Connect each front end of vertical lifting device to winch rear base support angle by driving in two mounting hinge pins. Secure hinge pins with cotter pins.

e. **Install Exhaust Stack and Shield** (fig. 272). Lift exhaust stack and shield into position on exhaust pipe and install two bolts, nuts, and lock washers which secure bottom of stack to pipe. Position top clamp around shield and secure it with a bolt, nut, and lock washer.

f. **Install Rear Mounting Bolts** (fig. 272). Install two bolts, two springs, and four flat washers (one washer on each end of each spring) which secure winch rear base angle to frame. Install platform plate on frame immediately back of tandem winch assembly, positioning four clips under frame side channels and tightening four cap screws.

g. **Install Throttle Control Cable and Tubing.** Pull throttle cable and tubing into position on winch assembly. Secure tubing to two brackets by installing a clip and two slotted head screws and nuts to each bracket. Install rod end pin and cotter pin which secure end yoke to throttle control hand lever.

h. **Install Spare Tire and Wheel.** Install spare tire and wheel on right side of vehicle.

i. **Install Floodlights.** Place two floodlights in brackets at top rear of cab. Install spring, washer, and nut which hold each light to its bracket. Attach cable plug to back of each light.

j. **Install Tandem Winch Guard.** Lift tandem winch guard into position on left side of tandem winch assembly. Open doors of stowage box on left side of vehicle to provide access to nuts. Then install four bolts, nuts, and lock washers which secure guard to rear of stowage box and install three bolts, nuts, and lock washers which secure guard to top of box. Install four bolts, nuts, and lock washers which hold guard brackets to winch rear base angle. Secure two oxygen tanks and one acetylene tank in position at left rear of cab.

k. **Remove Hoists and Chain Slings.** Remove two chain slings and hoists from tandem winch assembly.

l. **Adjust Winch Controls.** Adjust winch controls as instructed in paragraph 212.

## Section XXXIII

## FIFTH WHEEL

Paragraph
Description and data ........................................ 215
Removal ........................................ 216
Installation ........................................ 217

### 215. DESCRIPTION AND DATA.

a. **Description** (fig. 276). The lower fifth wheel coupler assembly is mounted on the rear of the frame. A spring-loaded locking jaw is actuated by a handle at the rear of the fifth wheel, and secures the semitrailer upper fifth wheel kingpin to the tractor lower fifth wheel, when coupling the semitrailer to the tractor.

b. **Data.**

| | |
|---|---|
| Manufacturer | Fruehauf |
| Model | F |

### 216. REMOVAL.

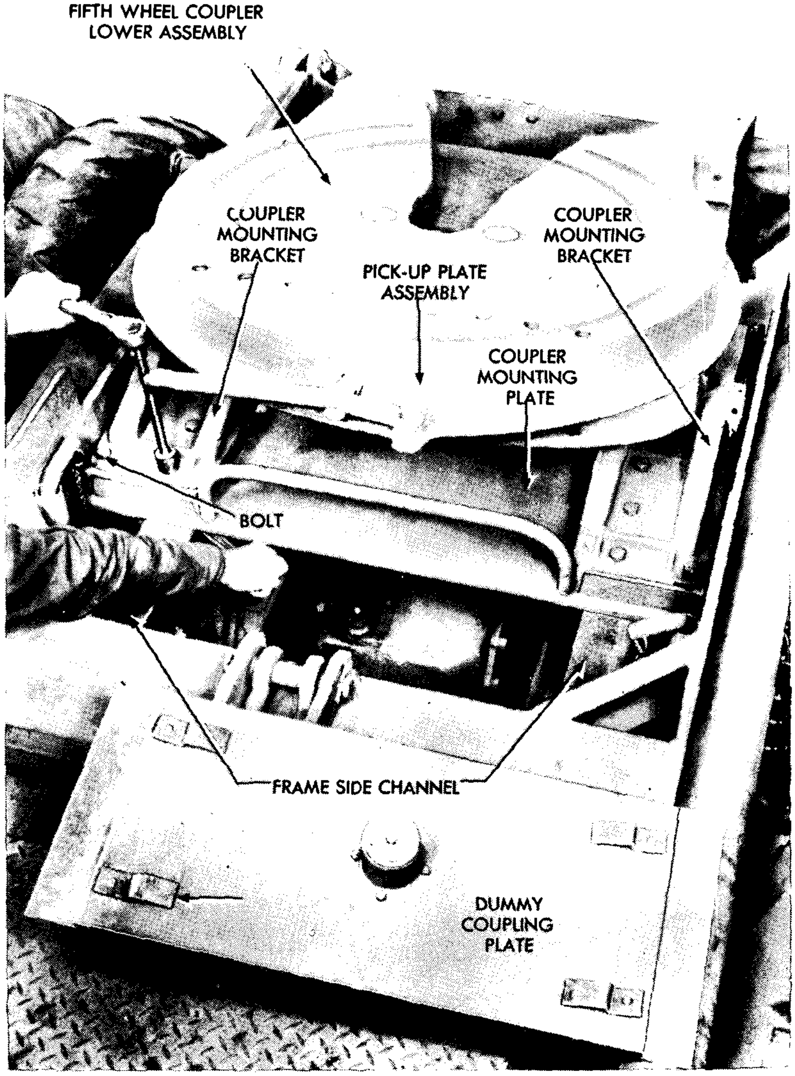
a. **Remove Dummy Coupling Plate** (fig. 276). Disconnect two coil springs from coupler mounting plate at rear of assembly. Remove dummy coupling plate in front of coupler by loosening four cap screws and lock washers so that clips underneath plate can be turned free of frame side channels. Removal of the dummy coupling plate provides access to bolts from underneath the coupler.

b. **Remove Coupler** (fig. 276). Remove 12 bolts, nuts, and lock washers which hold each coupler mounting bracket to frame side channel and coupler mounting plate at each side of fifth wheel coupler. Then attach a chain or rope sling to assembly and use a hoist to raise it straight up from frame and remove it from vehicle.

### 217. INSTALLATION.

a. **Install Coupler** (fig. 276). Attach a chain or rope sling to fifth wheel coupler and use a hoist to lift it into position on coupler mounting plate. Secure assembly to frame and coupler mounting plate by installing 12 bolts, nuts, and lock washers into each side of assembly.

b. **Install Dummy Coupling Plate** (fig. 276). Attach the two coil springs at rear of coupler to coupler mounting plate. Place dummy coupling plate in position on frame, positioning the four clips under frame side channels. Tighten the two cap screws and lock washers.


FIFTH WHEEL COUPLER LOWER ASSEMBLY
COUPLER MOUNTING BRACKET
PICK-UP PLATE ASSEMBLY
COUPLER MOUNTING BRACKET
COUPLER MOUNTING PLATE
BOLT
FRAME SIDE CHANNEL
DUMMY COUPLING PLATE

RA PD 76946

*Figure 276—Removal of Fifth Wheel Coupler Lower Assembly*

# PART THREE

# SEMITRAILER MAINTENANCE INSTRUCTIONS

## Section XXXIV

## ORGANIZATION TOOLS AND EQUIPMENT

Paragraph
Organization tools and equipment .......................... 218

### 218. ORGANIZATION TOOLS AND EQUIPMENT.

**a.** In addition to the tools listed in paragraph 36, the following are available to the using arms for the maintenance of this vehicle:

(1) STANDARD TOOL SETS. The tool sets available to individuals (Specialists) and organizations, dependent upon the allocation in the Tables of Equipment are listed in SNL N-19. The components of these tool sets are also listed and illustrated.

(2) SPECIAL TOOLS. The special tools for servicing the vehicle are listed in paragraph 37.

## Section XXXV

# BRAKE SYSTEM

Paragraph
Description . . . . . . . . 219
Data . . . . . . . . 220
Minor brake adjustment . . . . . . . . 221
Major brake adjustment . . . . . . . . 222
Brake cylinder . . . . . . . . 223
Drums . . . . . . . . 224
Air cleaner . . . . . . . . 225
Lines, tubing, and connections . . . . . . . . 226
Linkage . . . . . . . . 227
Slack adjuster . . . . . . . . 228
Lining replacement . . . . . . . . 229
Shoe assemblies . . . . . . . . 230
Air reservoir . . . . . . . . 231
Relay-emergency valve . . . . . . . . 232
Air brake emergency release valve . . . . . . . . 233

## 219. DESCRIPTION.

**a. Description.** The brakes are of the heavy duty, mechanical, internal expanding, two-shoe, eccentric anchor pin type, operating on the cam and lever principle. The "S" type cams are integral with the camshafts. The cams are carried on self-alining type ball bearings, plus needle bearings. The slack adjusters are of the 360-degree type, and permit rapid and proper adjustment of the brakes. The drums are of the ribbed type which permit fast dissipation of heat. The brakes are actuated by four air cylinders which are mounted in the hollow sections of walking beams; each cylinder provides braking power for two wheels. Emergency breakaway features are built into the emergency-relay valve, which will hold the semitrailer for a limited time should the semitrailer break away from the towing vehicle. An emergency brake release valve is provided to permit the release of the brakes when the tractor and the semitrailer are uncoupled. The brakes are controlled by a foot and hand control on the towing vehicle.

## 220. DATA.

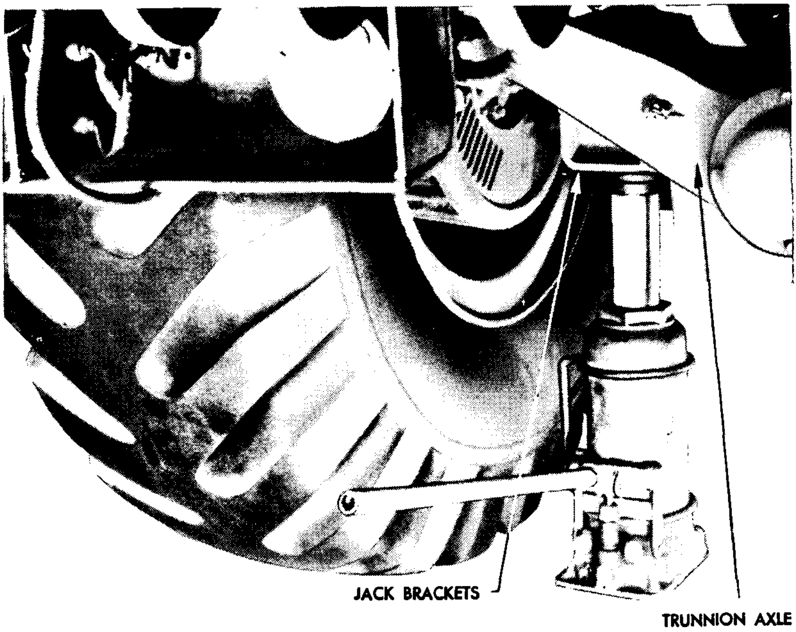
Brakes:

| | |
|---|---|
| Make | Fruehauf Trailer Company |
| Type | two-shoe internal expanding |
| Size | 16 in. x 6 in. |
| Lining size | ¾ thick x 6 in. 7¼ in. radius |
| Operating pressure | min. 60-lb |
| Copper air lines | ⅜-in. and ½-in. dia |
| Jumper hose (length) | 10½ ft |
| Relay-emergency valve (interchangeable with Bendix Westinghouse) | Midland |

## 221. MINOR BRAKE ADJUSTMENT.

**a. Jack-up Axle Assembly.** Jack up wheel assembly until wheel clears ground (fig. 277). CAUTION: *When jacking axle assembly, place jack under axle jack bracket to prevent jack slippage.*

**b. Adjusting Brake.** Turn adjusting screw in a counterclockwise direction until wheel cannot be turned. Turn adjusting screw in a clockwise direction, about two notches or more, until wheel turns freely (fig. 278). Adjusting procedure on all eight wheels is identical.



RA PD 57391

*Figure 277—Jacking Trunnion Axle*

## 222. MAJOR BRAKE ADJUSTMENT (fig. 279).

**a. Adjustment.** Make the following major brake adjustment only when the setting of the brake anchor pins has been disturbed, or when new lining, new shoes or new drums have been installed.

(1) Loosen both locking nuts on both anchor pins so that the anchor pins can be moved freely (fig. 295).

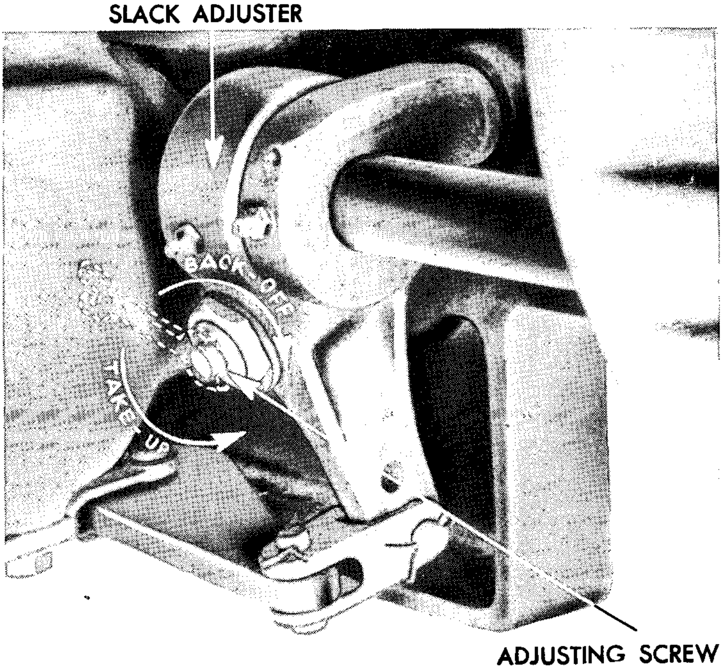
(2) Install the wheel assembly. NOTE: *If wheel assembly fails to move on axle spindle freely, slack off on the slack adjusters through counterclockwise movement of the slack adjuster adjusting screw, and centralize anchor pin eccentrics.*

(3) Turn the slack adjuster adjusting screw clockwise until the shoes are tight in the drum.

(4) Turn the eccentric anchor pin to right and left, and continue to tighten up on the slack adjuster until the brake shoes are centralized in the drum.

(5) Using a feeler gage, set the clearance at 0.010 inch at the eccentric end, and 0.015 inch at the cam end, of the brake shoes.

(6) Tighten lock nuts on the anchor pins while holding anchor pins firmly in position with wrench.



RA PD 57392

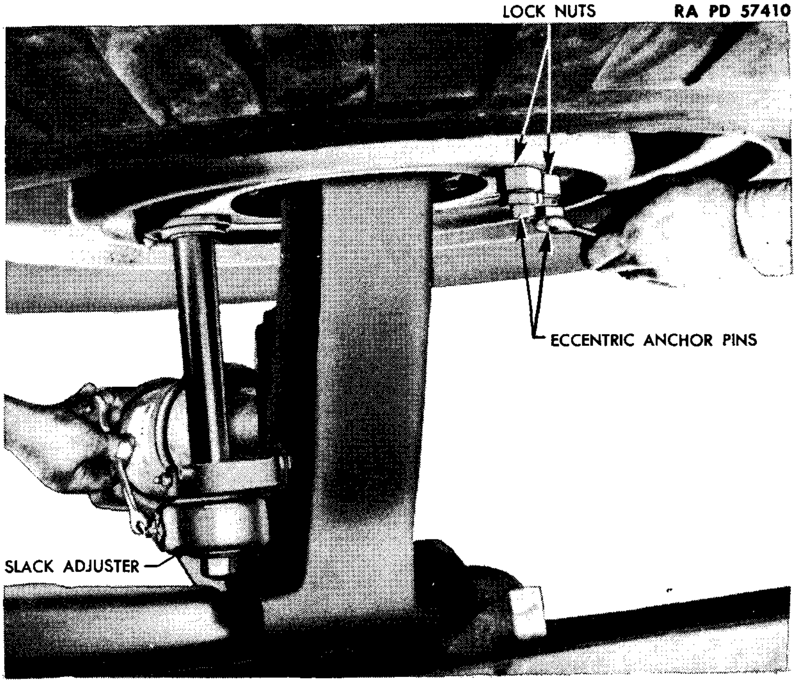
*Figure 278—Minor Brake Adjustment*

## 223. BRAKE CYLINDER.

**a. Description.** The two brake cylinders are mounted on a carrier plate. The plate in turn, is bolted to the underside of the walking beam. The function of the brake cylinder is to convert the energy of compressed air into the mechanical force necessary to expand the brake shoes against the brake drum and apply the brakes. Air pressure from the relay-emergency valve enters the port at rear of the brake cylinder. This air, held in check by a packing cup, moves a piston forward to rotate the slack adjuster and apply the brakes.

**b. Removal.**

(1) REMOVE CARRIER ASSEMBLY. Disconnect air lines at walking beam (fig. 280). Pull cotter pin from rod end pin at slack adjuster end of equalizer link and drive out rod end pin (fig. 281). Repeat above operation on opposite side and opposite end of equalizer. Place jack under center of walking beam and raise jack until jack cap contacts mounting plate. Remove alemite fittings and grease lines which protrude from the walking beam. Remove 14 cap screws and 14 lock washers holding the brake cylinder carrier assembly to underside of walking beam (fig. 282). Remove jack and lower brake cylinder carrier assembly to ground (figs. 282 and 283).

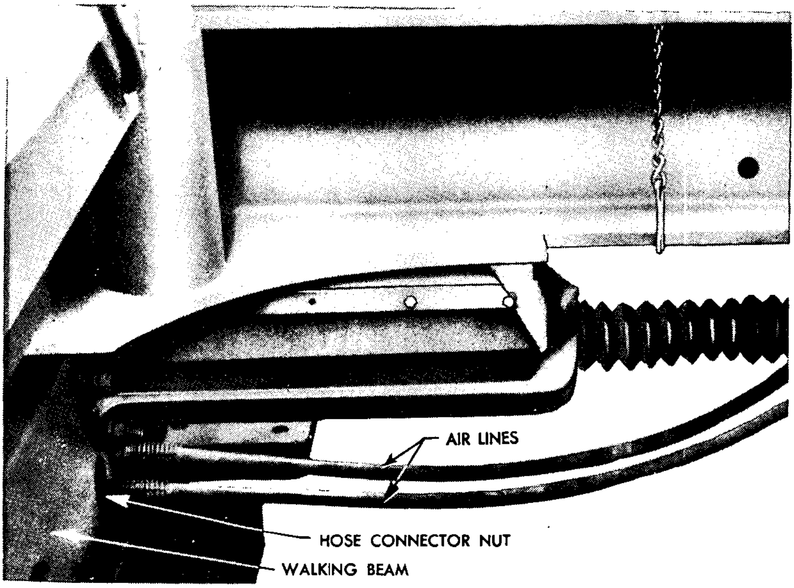


RA PD 57410

*Figure 279—Major Brake Adjustment*

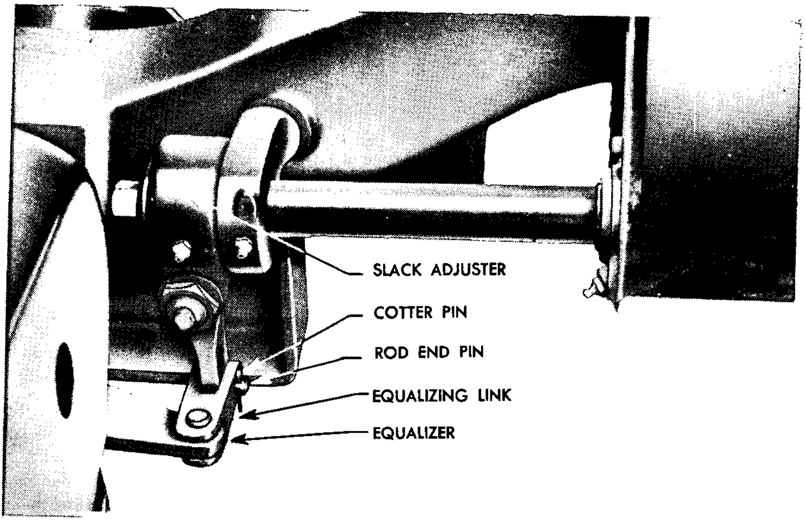
(2) REMOVE CYLINDER. Pull cotter pins from rear end of cylinder yoke. Drive out the two rod end pins. Lift cylinder off mounting bracket (fig. 282). Hold lock nut firmly with wrench and turn yoke off cylinder push rod.

**c. Maintenance.** Prior to installing cylinder, remove oil plug at air port. Inspect through the port to determine whether or not cylinder has sufficient amount of oil. NOTE: *Cylinder must have approximately $1\frac{1}{2}$ ounce of light grade engine oil.*


AIR LINES
HOSE CONNECTOR NUT
WALKING BEAM

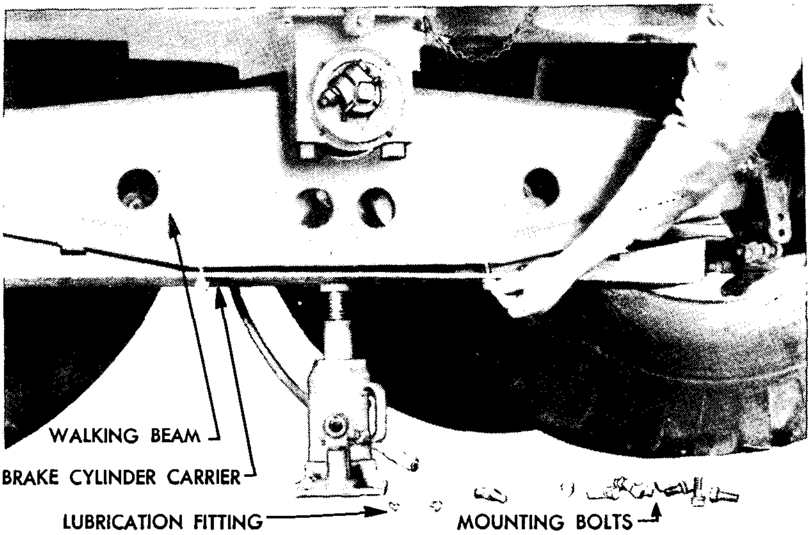
RA PD 57393

*Figure 280—Brake Cylinder Air Lines*


SLACK ADJUSTER
COTTER PIN
ROD END PIN
EQUALIZING LINK
EQUALIZER

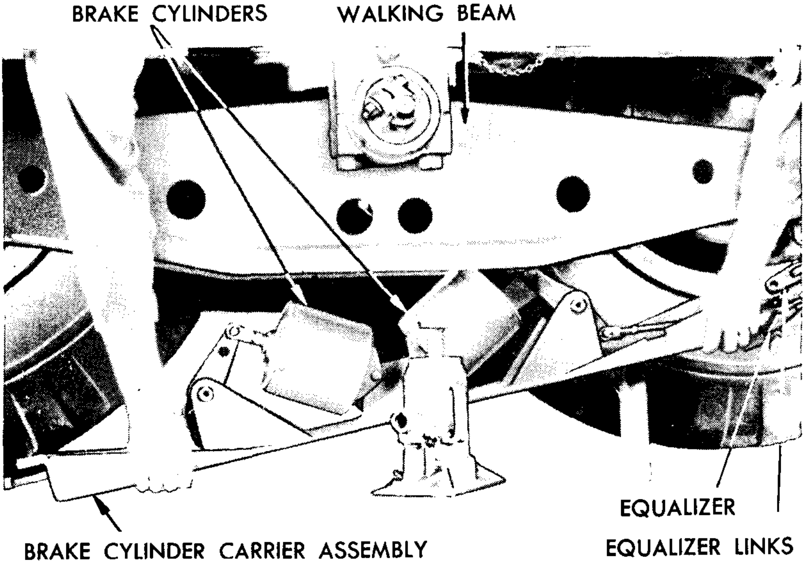
RA PD 57394

*Figure 281—Equalizer, Equalizer Links, and Slack Adjuster*


WALKING BEAM
BRAKE CYLINDER CARRIER
LUBRICATION FITTING
MOUNTING BOLTS

RA PD 57395

*Figure 282—Removing Brake Carrier Mounting Cap Screws*


BRAKE CYLINDERS
WALKING BEAM
BRAKE CYLINDER CARRIER ASSEMBLY
EQUALIZER
EQUALIZER LINKS

RA PD 57396

*Figure 283—Removing Brake Carrier Assembly*

**d. Installation.**

(1) INSTALLING CYLINDER ON CARRIER MOUNTING PLATE. Install jam nut on cylinder push rod. Turn jam nut on cylinder push rod as far as it can be turned Screw yoke onto cylinder push rod until it reaches a stop. Lock yoke in position with jam nut. Place cylinder on mounting bracket. Secure cylinder to bracket with rod end pin and cotter pin (fig. 285). NOTE: *When installing one cylinder it is very important that the air port in the cylinder be facing in the same direction as the port in the cylinder which is mounted on carrier. If two cylinders are being mounted, make certain both ports are facing in the same direction. If air ports are in opposite directions, the air line which is coupled to the brake cylinder will not be long enough to accommodate both cylinders.* Couple cylinder yoke to top hole in brake lever, using clevis pin and cotter pin to secure in place. Cover all rod end pins with oil. Tighten yoke jam nut and pull out on cylinder push rod to make certain cylinder operates freely. Remove hose connector body from cylinder and install it in air port in cylinder.

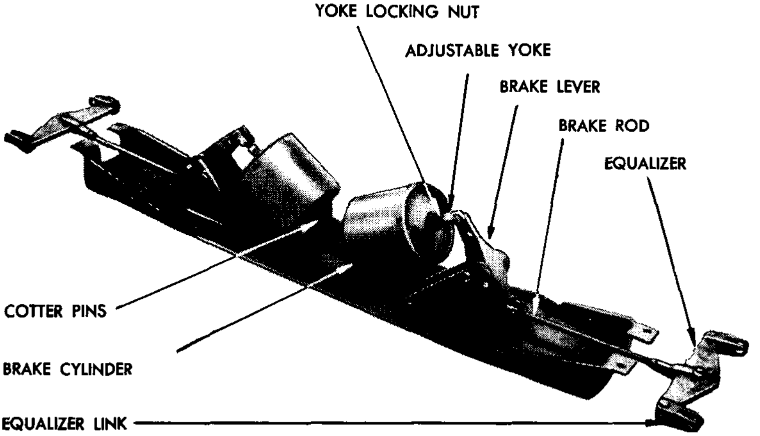


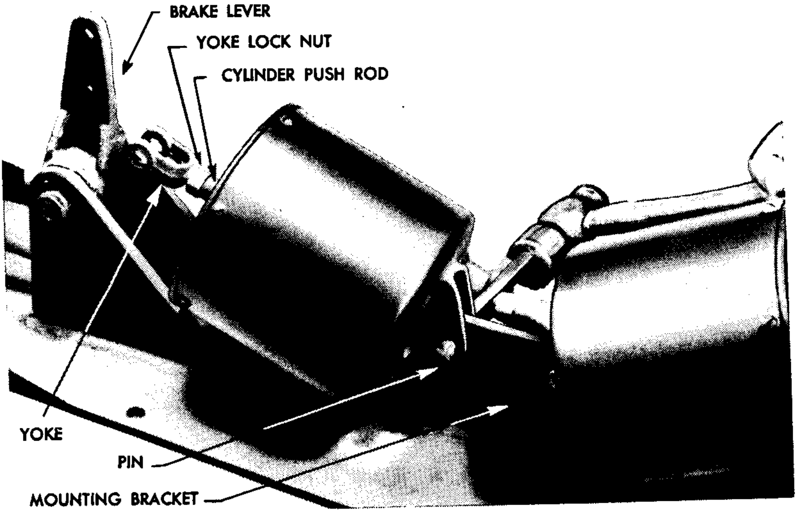
*Figure 284—Brake Cylinder Carrier Assembly*

(2) INSTALLING CARRIER ASSEMBLY. Place jack under center of walking beam. Place cylinder carrier assembly on jack making certain the two air ports in cylinder are facing toward inner side of semitrailer (figs. 283 and 284). Bolt the carrier assembly to walking beam using 14 lock washers and 14 cap screws (fig. 282). Install the two oil lines and alemite fittings. Lubricate the two fittings. Couple the four equalizers to slack adjusters using rod end pins and cotter pins (fig. 281). Place several drops of oil on each rod end pin. Couple the two air hose to brake cylinders (fig. 280). Make minor

adjustment on brakes on the four wheels of the assembly which brake carrier assembly controls (par. 221). NOTE: *Prior to placing semitrailer into operation, place semitrailer brakes in the applied position. Cover hose connection with soapy water to detect air leaks. Should a leak be detected, tighten hose connection body and nut until leak disappears, however, a three-inch bubble in ten seconds is permissible.*

## 224. DRUMS.

**a. Description.** The drum is of cast mechanite iron with thirty cooling ribs spaced evenly around the outside diameter. The drum may be inspected without removing wheel and hub assembly from the trunnion axle.



RA PD 57398

*Figure 285—Removing Brake Cylinder from Carrier*

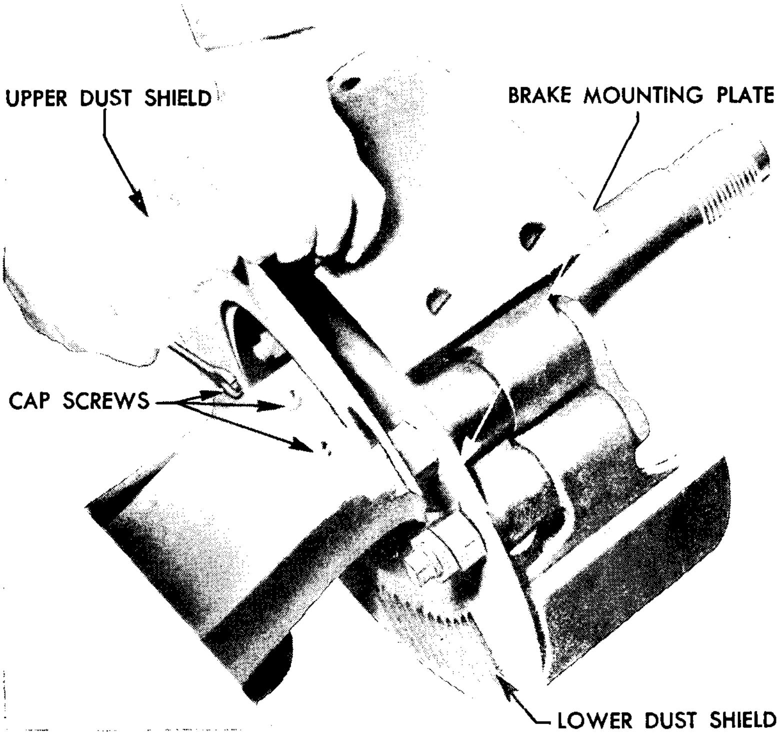
**b. Inspection.** Remove six cap screws holding upper and lower dust shield to brake mounting plate. Remove dust shields (fig. 286).

**c. Removal.** Remove wheel and hub assembly as one unit (par. 255 a). With one man holding nuts to prevent them from turning, remove the six mounting bolts holding drum to hub flange (fig. 287).

**d. Installation.** Tip wheel and hub assembly against semitrailer frame at about a 30-degree angle. Clean all dust and other foreign matter from surface of drum pilot. Place drum in position on drum pilot. Aline holes in drum with those in hub. Install bolts, nuts, and lock washers. Successively tighten opposite nuts to bring drum down evenly, and prevent cocking of drum on drum pilot. Install wheel and hub assembly on trunnion axle (par. 255 d).

## 225. AIR CLEANER.

**a. Description.** Air cleaners are mounted at rear end of top decking. One cleaner is installed in emergency brake air line and the other in service brake line. Air cleaners consist of a metal screen mounted in a housing; they are designed to prevent dirt, water and other foreign matter from entering the relay-emergency valve. No adjustment is required to maintain efficient functioning of cleaner. However, cleaner must be drained every 1,000 miles, and disassembled and thoroughly cleaned every 6,000 miles.



RA PD 57399

*Figure 286—Removing Brake Dust Shields*

**b. Draining Air Cleaner** (fig. 288). Close the service and the emergency air line shut-off valves at rear of towing vehicle. Remove drain plug from bottom of air cleaner, allow all moisture to drain, and replace plug. Close the two shut-off valves.

**c. Cleaning** (fig. 289). Remove the two cap screws holding sediment bowl to body. Remove strainer support and pull strainer out of body. Wash strainer in dry-cleaning solvent, and replace.

d. **Removal** (fig. 288). Shut off air supply at towing vehicle. Disconnect the two lines which lead into cleaner body. Remove the two connector bodies. Remove the two cap screws holding cleaner to mounting bracket, and lift cleaner out.

e. **Installation.** Place cleaner in position on mounting brackets. Install two cap screws, but do not tighten. Install the two connector bodies on the air cleaner. Couple the two air lines to the connector bodies and tighten the two cap screws holding cleaner to mounting bracket. Open air valves at rear of towing vehicle and test tubing connectors for leaks, using soapy water. Should leaks occur, tighten tube connector bodies and nuts. NOTE: *When installing cleaner, it is very important that the arrow embossed on the outer side be pointing toward the air line which runs to the rear of unit* (fig. 289). Open shut-off valves at rear of towing vehicle.

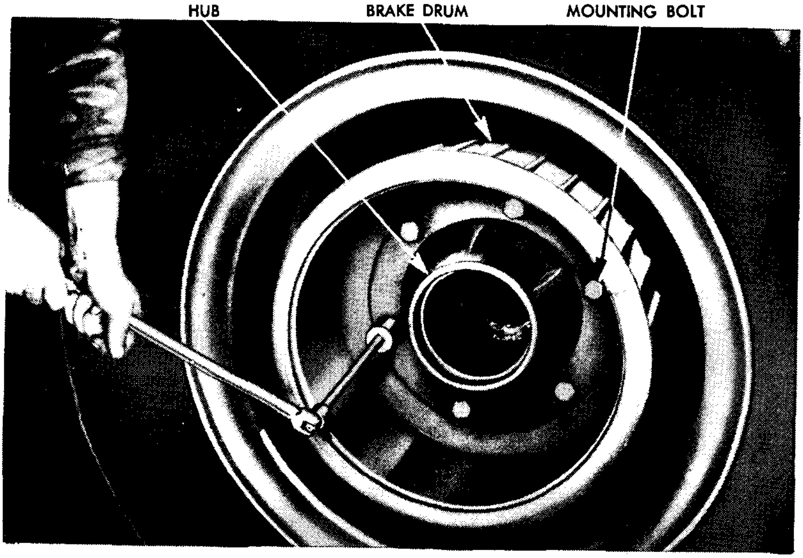


*Figure 287—Removing Brake Drum from Wheel and Hub Assembly*

## 226. LINES, TUBING, AND CONNECTIONS.

a. **Description** (figs. 290, 298 and 299). Two flexible air lines, with couplings attached, are used between semitrailer and towing vehicle. Four flexible air lines are used between air outlet on main frame members and brake cylinders which are mounted on inside of walking beam. Balance of air lines are of $3/8$-inch diameter copper tubing, except lines between air reservoirs and relay-emergency valve, which are $1/2$-inch diameter tubing.

**b. Removal.** Close shut-off valves at rear of towing vehicle. Open drain cocks at underside of air reservoirs. Allow all air to drain from semitrailer brake system. Remove the brass nuts from each end of damaged tubing. Pry open clips holding tubing to frame and pull tubing and loom out.

**c. Installation.** Thread copper tubing through loom. Install the line, forming it to fit the frame work while making proper bends. Place tubing connector nut over tubing. Place sleeve over tubing Place end of tubing into tubing connector body, hold tubing firmly and straight into connector body, and tighten the connector nut. NOTE: *It is very important that care be exercised when bending and forming tubing to fit frame. A sharp bend will kink tubing and retard brake application and release. Keep dirt and other foreign matter out of tubing. When making a cut, use a tubing cutter, not a hacksaw. Copper dust in tubing is detrimental to functional parts of relay-emergency valve. When cutting tubing with a tube cutter, feed cut-*

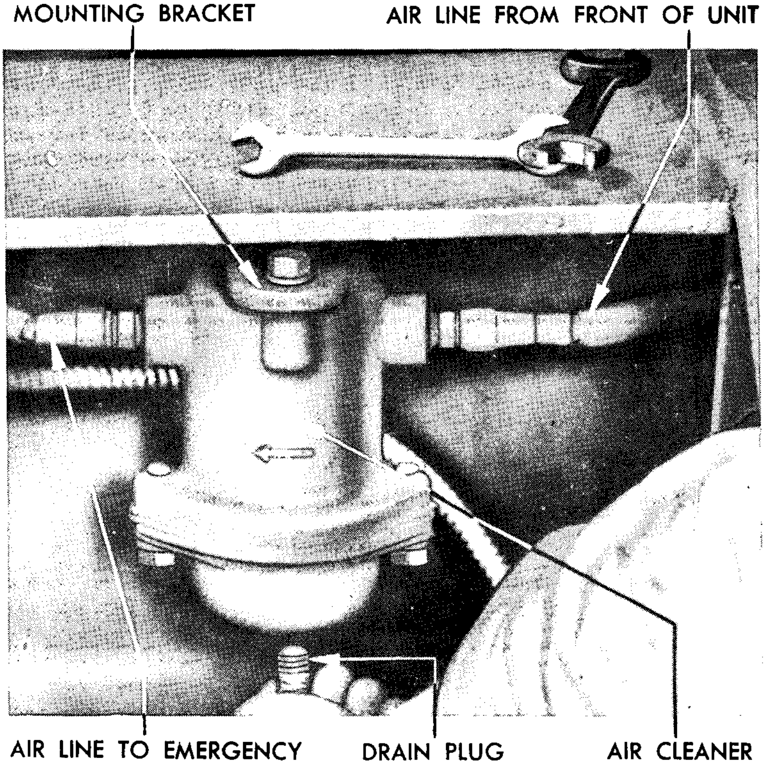

MOUNTING BRACKET
AIR LINE FROM FRONT OF UNIT
AIR LINE TO EMERGENCY RELAY VALVE
DRAIN PLUG
AIR CLEANER
RA PD 57401

*Figure 288—Draining Air Cleaner*

*ting wheel into the tubing, a very small amount with each complete rotation until the tube is cut. If the cutter is fed too rapidly, the end of tubing may become beveled inward, thus reducing the inside diameter of the tube. Make certain all lines are properly anchored to frame members, using tubing clips which are welded to frame members.* When small portion of tubing becomes damaged, cut off the damaged section and replace with new, using standard ⅜-inch Westinghouse tubing union at each end of replacement tube. No attempt should be made to repair damaged ½-inch copper lines. Remove and replace with new. Close drain cock on reservoir. Open shut-off valves at rear of towing vehicle. Check for leakage (par. 226 d).

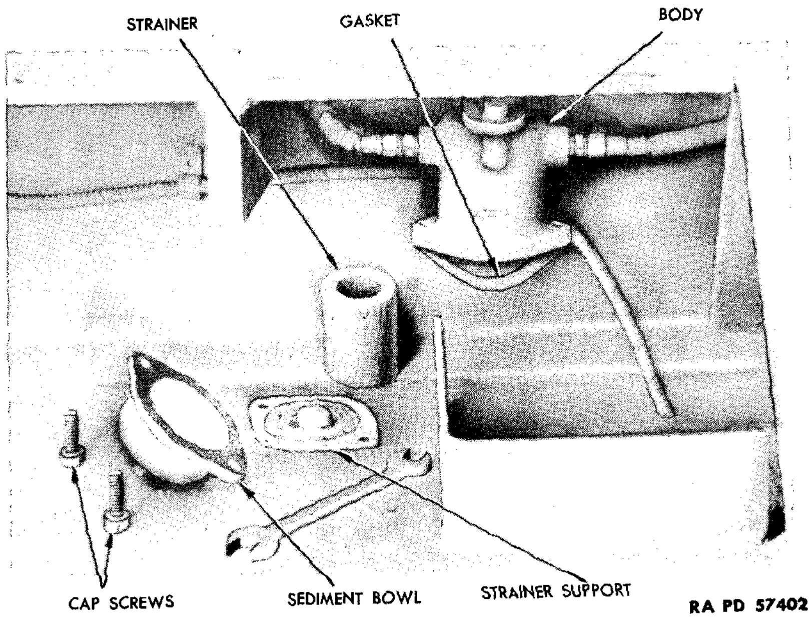


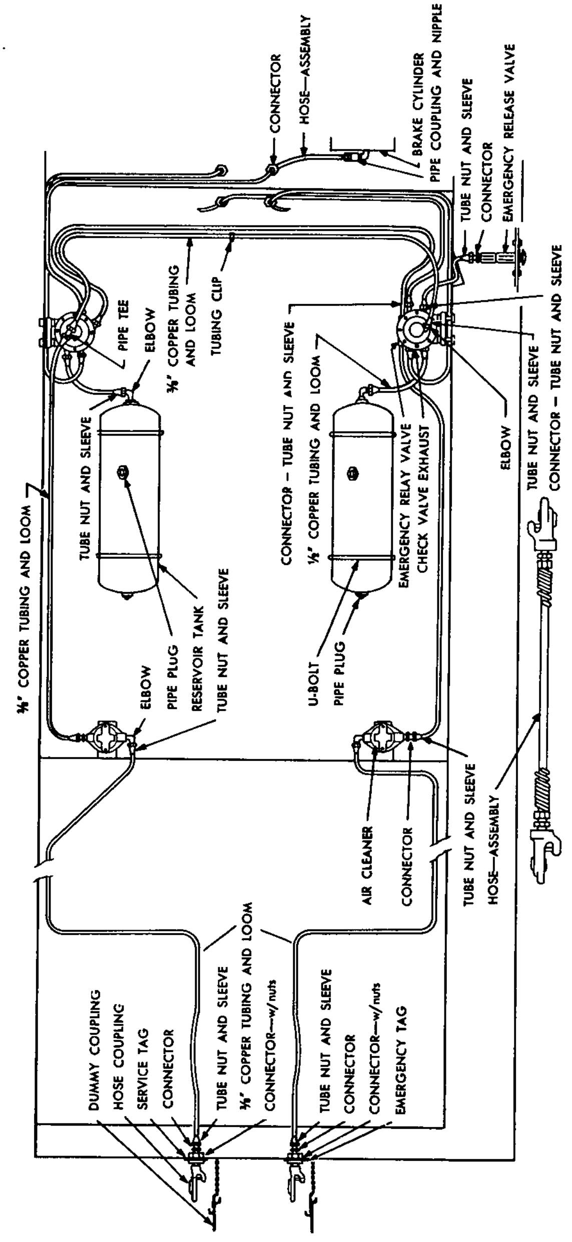
*Figure 289—Air Cleaner Disassembled*

d. **Leakage Test.** With brakes applied, cover tube connector with soapsuds. A 3-inch bubble in 10 seconds is permissible. Leakage in excess must be corrected by tightening connector body and nuts.

## 227. LINKAGE (figs. 284 and 291).

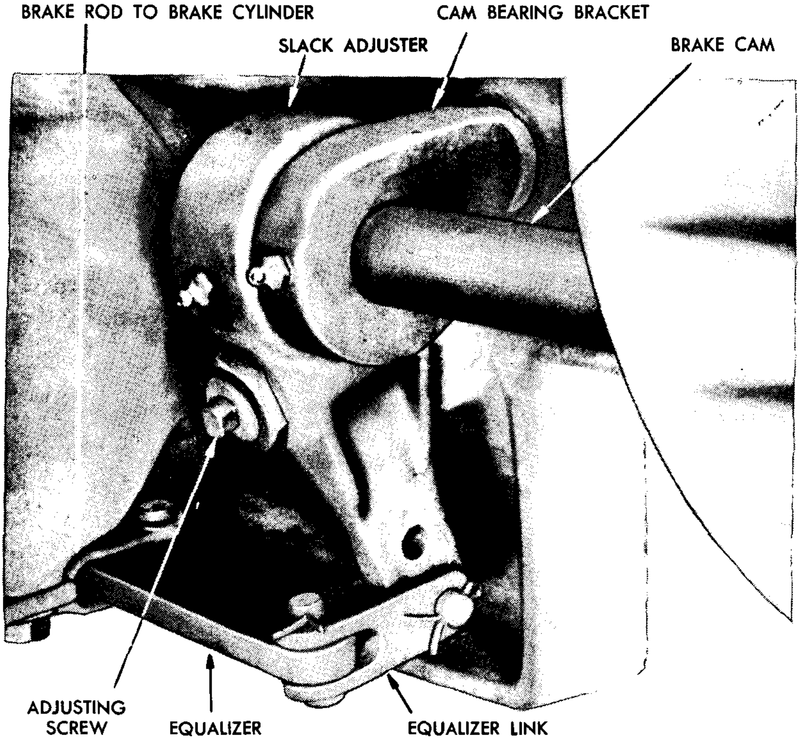
a. **Description.** Linkage consists of eight equalizer links, four equalizers, and four brake rods.

b. **Removal of Equalizer Link.** Pull cotter pins from equalizer link pins. Drive out both pins. Turn adjusting screw on slack adjuster in a counterclockwise direction until slack adjuster clears equalizer link. Pull equalizer link off equalizer.


CONNECTOR
HOSE—ASSEMBLY
BRAKE CYLINDER
PIPE COUPLING AND NIPPLE
TUBE NUT AND SLEEVE
CONNECTOR
EMERGENCY RELEASE VALVE
TUBE NUT AND SLEEVE
PIPE TEE
ELBOW
⅜" COPPER TUBING AND LOOM
TUBING CLIP
CONNECTOR - TUBE NUT AND SLEEVE
½" COPPER TUBING AND LOOM
EMERGENCY RELAY VALVE
CHECK VALVE EXHAUST
ELBOW
TUBE NUT AND SLEEVE
CONNECTOR - TUBE NUT AND SLEEVE
⅜" COPPER TUBING AND LOOM
TUBE NUT AND SLEEVE
ELBOW
PIPE PLUG
RESERVOIR TANK
TUBE NUT AND SLEEVE
U-BOLT
PIPE PLUG
AIR CLEANER
CONNECTOR
TUBE NUT AND SLEEVE
HOSE—ASSEMBLY
DUMMY COUPLING
HOSE COUPLING
SERVICE TAG
CONNECTOR
TUBE NUT AND SLEEVE
⅜" COPPER TUBING AND LOOM
CONNECTOR—w/nuts
TUBE NUT AND SLEEVE
CONNECTOR
CONNECTOR—w/nuts
EMERGENCY TAG

RA PD 57403

*Figure 290—Brake System Diagram*



RA PD 57404

*Figure 291—Brake Linkage*

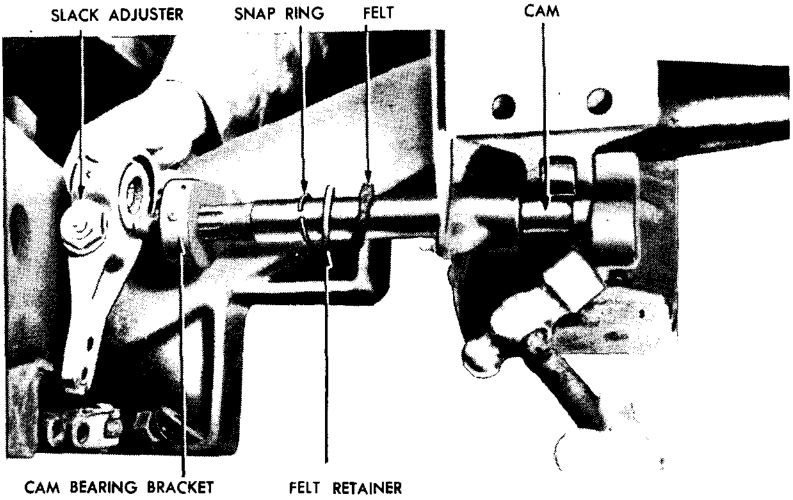
c. **Installation of Equalizer Link.** Place equalizer link in position on equalizer. Place a light film of grease over rod end pin and install rod end pin through link and equalizer. Install cotter pin in rod end pin. Turn adjusting screw on slack adjuster in a clockwise direction until upper hole in slack adjuster is in alinement with hole in equalizer link. Place a light film of grease over rod end pin and install pin through hole in equalizer link and slack adjuster (fig. 291). Give brake on wheel with the new equalizer link and the wheel opposite, a minor brake adjustment (par. 221).

d. **Removal of Equalizer.** Pull cotter pins from rod end pins at equalizer end of equalizer links and drive out rod end pins. Turn adjusting screw on slack adjuster in a counterclockwise direction until equalizer links clear equalizer. Remove rod end pin from brake rod and equalizer, and pull equalizer out.

e. **Installation of Equalizer.** Install equalizer in position on brake rod. Place a light film of grease over rod end pin and install clevis in brake rod and equalizer. Turn slack adjuster adjusting screw in a clockwise direction until holes in equalizer links meet holes in equalizer. Secure equalizer links in equalizer, using the two rod end pins. Install cotter pins in the rod end pin and the two rod end pins. Give brakes a minor brake adjustment (par. 221).

## 228. SLACK ADJUSTER.

**a. Description.** The slack adjuster acts as a brake lever and also provides a quick and easy method of adjusting brakes. The slack adjuster is mounted on camshaft and is attached to the brake equalizer link. The air pressure in the brake cylinder moves the slack adjuster, thus expanding the shoes in the drum. The semitrailer is equipped with eight slack adjusters and they are interchangeable.

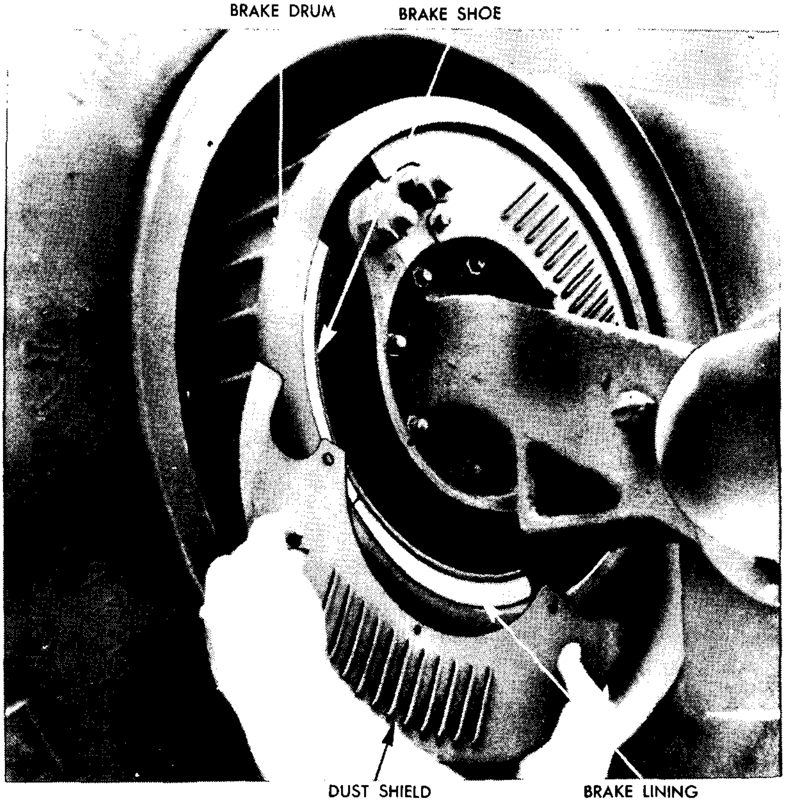


RA PD 57482

*Figure 292—Removing Slack Adjuster*

**b. Removal** (figs. 291 and 292). Remove wheel and hub assembly in one unit (par. 255). Remove cotter pin and rod end pin from equalizer link. Pry snap ring out of groove in camshaft. Tap snap ring, felt retainer and felt toward slack adjuster. Remove two lock nuts and flat washers from cam. Tap the "S" portion of cam towards the outer side of brake assembly about two inches. Tap slack adjuster off cam.

**c. Installation.** Coat the splined surface of camshaft with grease. Install slack adjuster on camshaft making certain the adjusting screw is facing away from trunnion axle. Tap cam through slack adjuster. Secure slack adjuster to camshaft, using flat washer and double nuts. Attach equalizer link to slack adjuster, using rod end pin and cotter pin. Give brake minor brake adjustment (par. 221).



RA PD 57405

*Figure 293—Removing Dust Shield for Brake Inspection*

## 229. LINING REPLACEMENT.

**a. Description.** Lining is of the molded block type, ¾ inch thick and six inches wide. Two blocks are bolted to each brake shoe. All brake linings are interchangeable throughout semitrailer brakes.

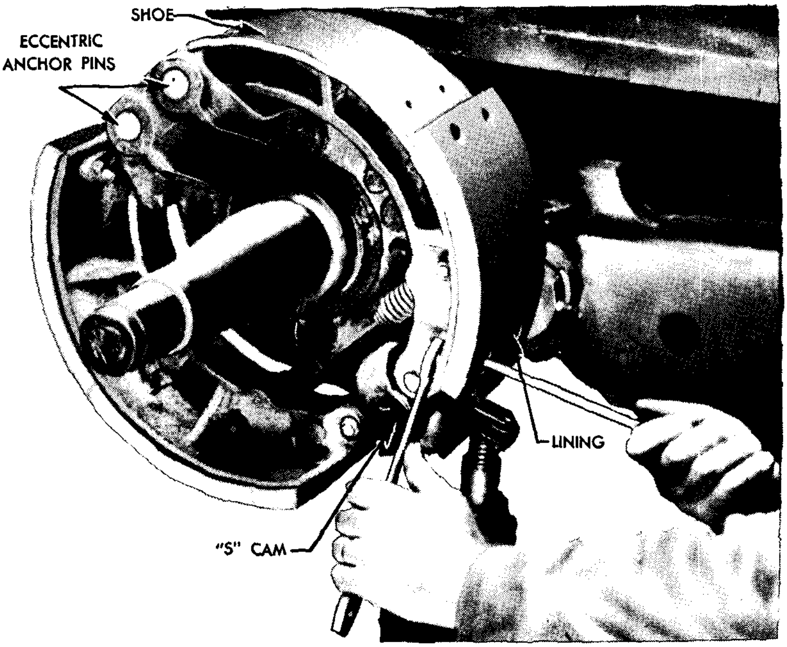
**b. Inspection** (fig. 293). Inspect brake shoes and linings without removing wheels from the axle, by removing the two dust shields which are bolted to brake adapter with six cap screws. Check for lining thickness (minimum thickness ¼ inch), and grease on the lining. NOTE: *It is essential that linings on all brake shoes be of same material to assure equalized braking. If lining is found to be grease-soaked, all four brake blocks on that spindle must be replaced.*

**c. Removal of Lining** (fig. 294). Remove the wheel and hub assemblies as one unit (par. 252). Remove the dust shields (fig. 286). Remove the screws, nuts and lock washers holding brake lining to the shoes.

**d. Installation.** Clean all foreign matter from the surface of brake shoes. Install the lining, making certain that the bolts holding lining to shoes are properly tightened and that lock washers are used. Before installing wheels, loosen the two anchor pins (fig. 295). Make certain that the anchor pins move freely. Lubricate the anchor pins with a light grade engine oil or penetrating oil; place grease around the "S" position of cam. Install wheel and hub assembly (par. 252 **b**). Adjust brakes (par. 222).

## 230. SHOE ASSEMBLIES (figs. 296 and 297).

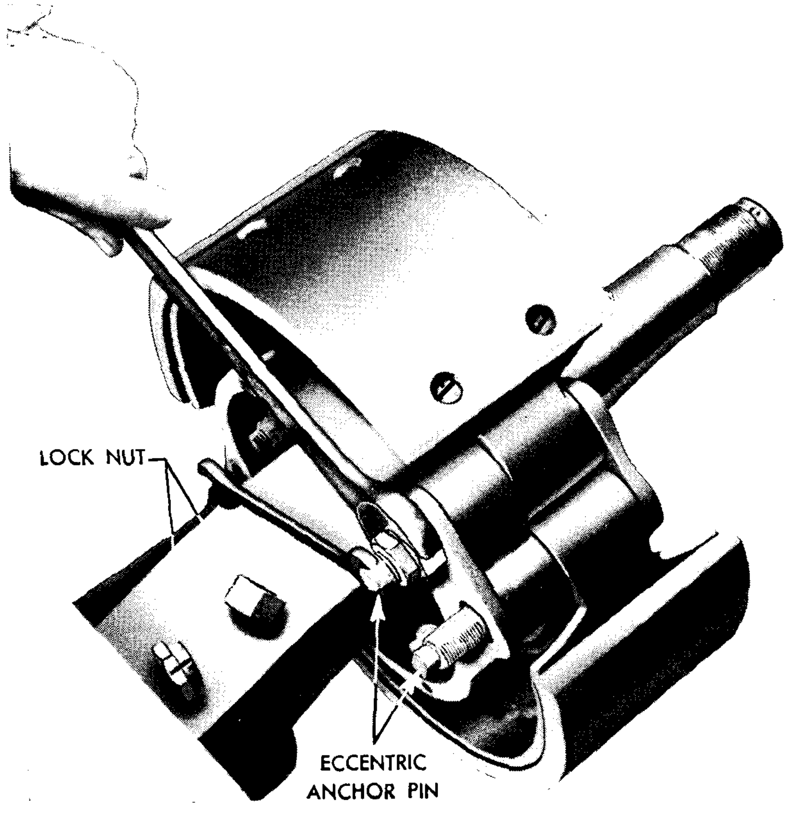
**a. Removal.** Remove wheel and hub assembly as one unit (par. 252). Remove three bolts holding anchor plate bracket to mounting plate, and tap anchor plate bracket off eccentric anchor pins. Pull upper and lower shoe assembly off cam and anchor pins. Remove the two bolts holding spring to shoes.



RA PD 57406

*Figure 294—Removing Brake Lining*

**b. Installation.** Place a light film of grease over surface of brake anchor pins before installing shoes. Do not allow grease or oil to get on surface of brake shoes. NOTE: *When installing new shoes do not install one shoe only, instead, replace both shoes on that spindle. Brake shoes are interchangeable throughout semitrailer.* Lay the two



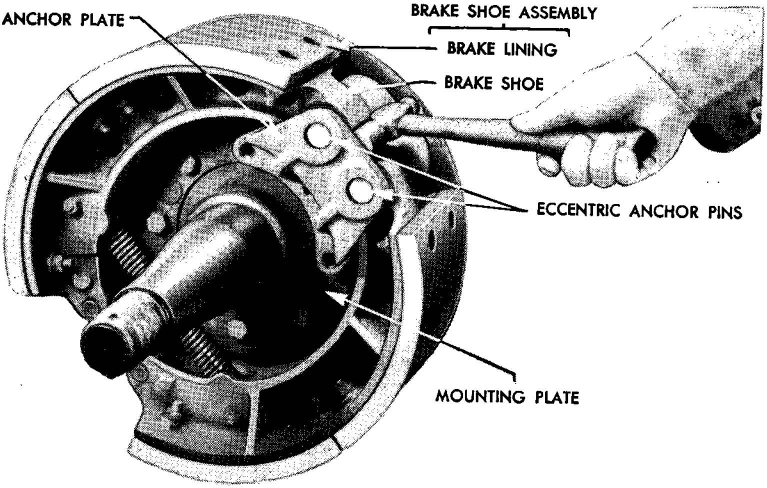
RA PD 57407

*Figure 295—Removing Brake Anchor Pins*

shoe assemblies on floor and install guide return spring and two bolts. Place a heavy coat of wheel bearing grease over top and bottom surface of S-cam. Place a light film of grease around anchor pins. Place brake shoes on anchor pins and S-cam. Place anchor plate in position, and install the three bolts. Turn adjusting nut on slack adjuster nut in clockwise direction to place shoes on an "O" point. Install wheel and hub assembly (par. 252 **b**). Prior to removing jacks, make a major brake adjustment (par. 222).

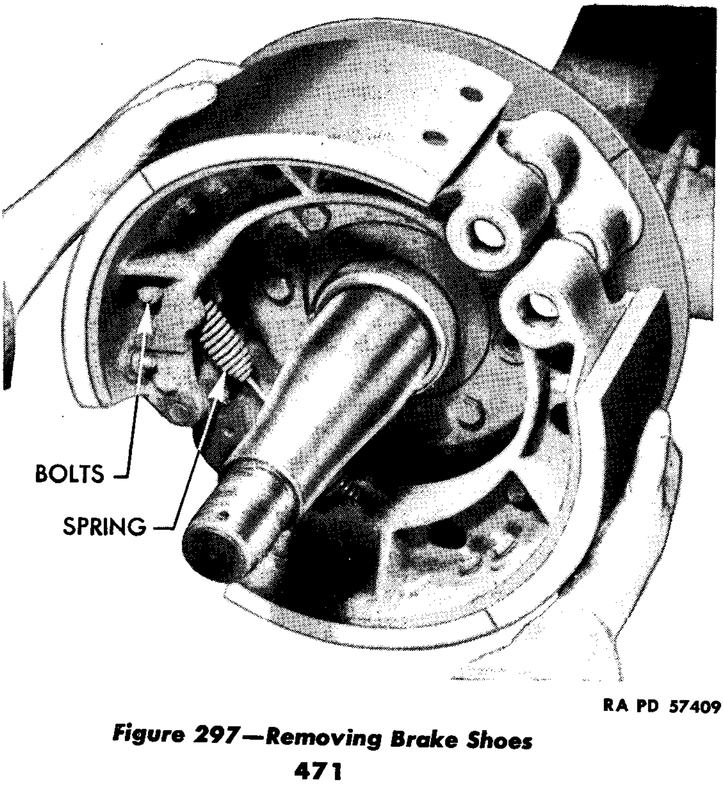
## 231. AIR RESERVOIR.

**a. Description.** The semitrailer is equipped with two reservoirs. They are located on the inside of main frame members toward the rear of the semitrailer on semitrailer deck. A sheet metal housing is provided to protect them from damage.


ANCHOR PLATE
BRAKE SHOE ASSEMBLY
BRAKE LINING
BRAKE SHOE
ECCENTRIC ANCHOR PINS
MOUNTING PLATE

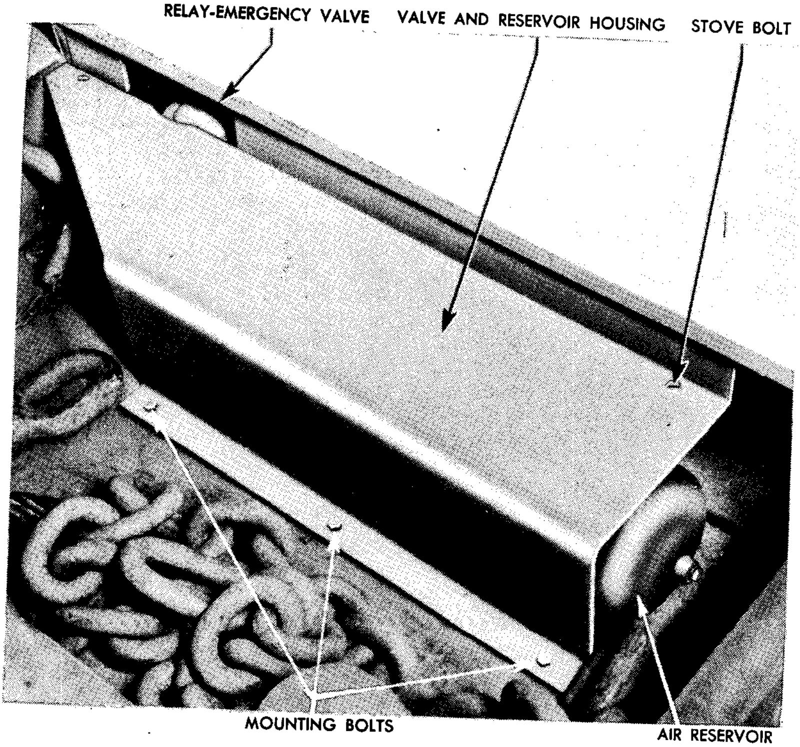
RA PD 57408

*Figure 296—Removing Brake Anchor Plate*


BOLTS
SPRING

RA PD 57409

*Figure 297—Removing Brake Shoes*



RA PD 57411

*Figure 298—Relay-emergency Valve and Reservoir Housing*

**b. Removal.** Close both air shut-off valves at towing vehicle. Remove the two stove bolts and three cap screws and lift air reservoir housing off semitrailer decking (fig. 298). Disconnect tubing at tank inlet (fig. 299). Remove the two U-bolts holding tank to frame deck and lift tank out. Remove drain cock, pipe plug and connector body.

**c. Installation.**

(1) Install drain cock, pipe plug and tubing connection body in tank. Open drain cock, and place in position, making certain drain cock in tank extends through hole in semitrailer decking. Connect ½-inch copper tubing to tubing connector body at tank. Secure tank to semitrailer decking, using two U-bolts, four nuts and four lock washers.

(2) Open both air valves at towing vehicles to allow air to blow out of drain cock in bottom of tank. Keep drain cock open several seconds to permit all sand, dust or other foreign matter which may have accumulated in tank, to escape. Close drain cock and check for leaks. Cover drain cock, pipe plug, and tubing connector with soapy

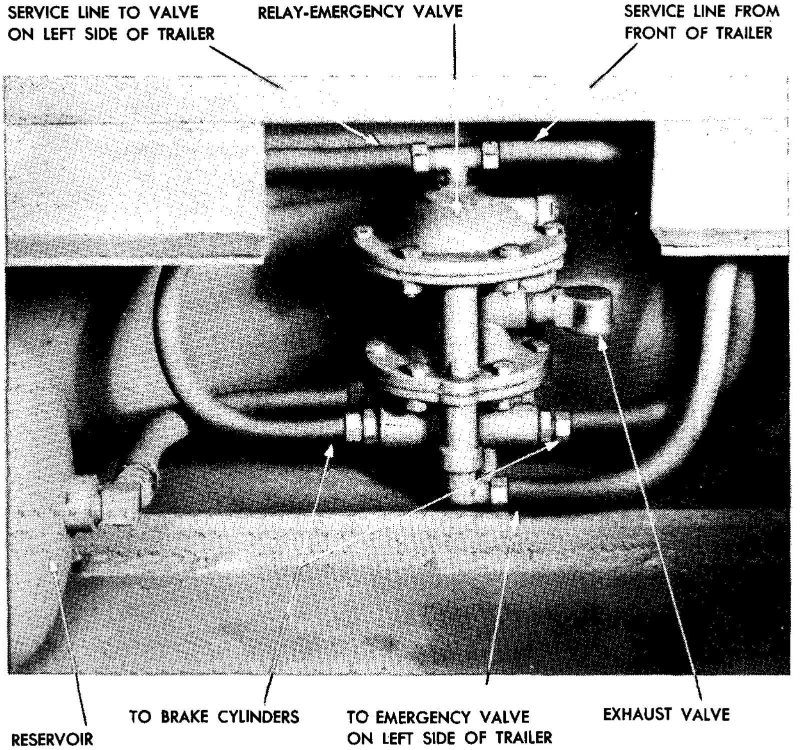

SERVICE LINE TO VALVE ON LEFT SIDE OF TRAILER
RELAY-EMERGENCY VALVE
SERVICE LINE FROM FRONT OF TRAILER
RESERVOIR
TO BRAKE CYLINDERS
TO EMERGENCY VALVE ON LEFT SIDE OF TRAILER
EXHAUST VALVE
RA PD 57412

*Figure 299—Relay-emergency Valve Mounted on Left Side*

water. Should bubbles appear, tighten the fitting until bubbles disappear. Install housing over tank, securing it to decking with two stove bolts and three cap screws.

## 232. RELAY-EMERGENCY VALVE.

**a. Description.** The semitrailer is equipped with two relay-emergency valves. Both valves are identical in construction. One valve is mounted ahead of front wheels on right side and the other on left side under sheet metal housing. Purpose of valve is to give operator rapid control of semitrailer brakes, in both application and release. Valve is provided with emergency features which automatically apply the brakes should semitrailer break away from towing vehicle.

**b. Removal** (figs. 298, 299 and 300). Remove two stove bolts and three cap screws from housing and lift housing out. Close the two shut-off valves at rear of towing vehicle. Remove all tubing connector nuts from connection bodies and all other fittings. Remove the two bolts holding emergency-relay valve to semitrailer frame and

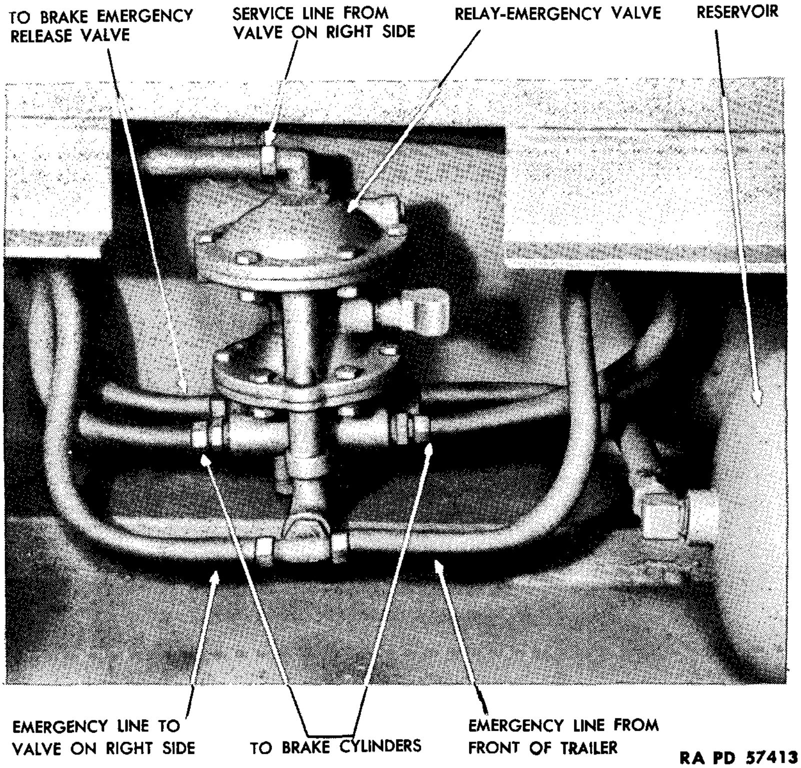

TO BRAKE EMERGENCY RELEASE VALVE
SERVICE LINE FROM VALVE ON RIGHT SIDE
RELAY-EMERGENCY VALVE
RESERVOIR
EMERGENCY LINE TO VALVE ON RIGHT SIDE
TO BRAKE CYLINDERS
EMERGENCY LINE FROM FRONT OF TRAILER
RA PD 57413

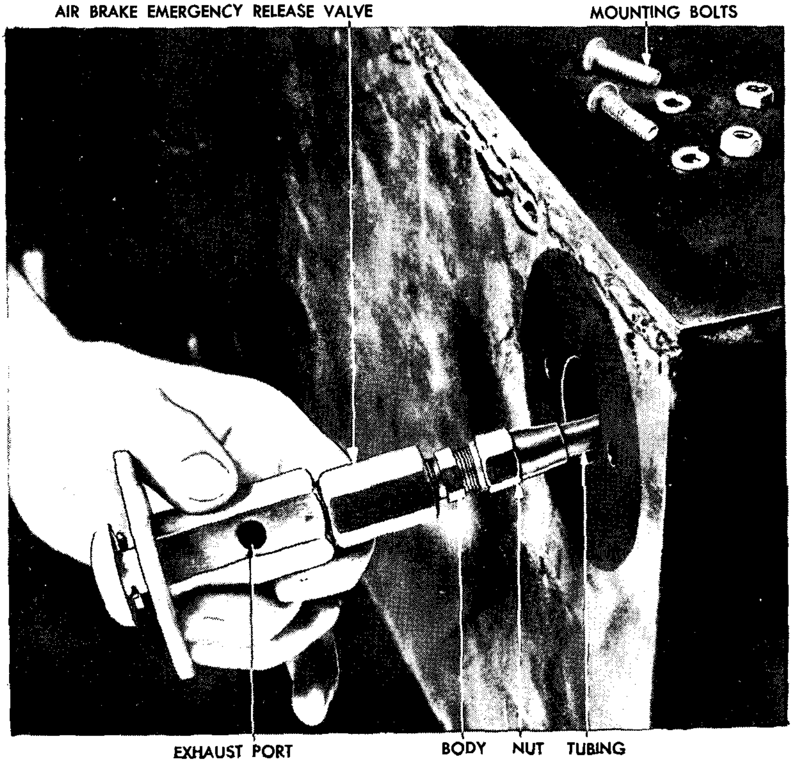
*Figure 300—Relay-emergency Valve Mounted on Right Side*

lift out. NOTE: *Replacement valve is furnished without fittings.* CAUTION: *When screwing "T" and "L" fittings out of relay-emergency valve, do not use wrench against the threaded portion, turn from unthreaded portion of the fittings.*

c. **Installation** (figs. 299 and 300). Coat the threaded portions of all valve fittings with shellac. Install fittings in valve, making certain the fittings are tight. Install the two bolts holding valve to semitrailer frame but do not tighten the bolts. Couple each air line to valve fittings. Tighten the two bolts holding valve to semitrailer frame. Open the two shut-off valves at rear of towing vehicle. With 60 pounds minimum pressure, test all valve fittings and tubing connectors with soapy water. If leaks are discovered, tighten fitting and connector nuts until leak disappears. Install housing, securing housing to deck with two stove bolts and three cap screws.

## 233. AIR BRAKE EMERGENCY RELEASE VALVE (figs. 299 and 301).

a. **Description.** This unit is equipped with one emergency air



RA PD 57414

*Figure 301—Removing Emergency Release Valve*

release valve. It is located on the left-hand side of semitrailer on outer side of the tool compartment ahead of front tires. The purpose of this valve is to release the brake when it is necessary to move semitrailer without using towing vehicle, or should brakes fail to release at hand control of towing vehicle. When valve button is pressed, air is released from the entire brake system of both the semitrailer and towing vehicle, unless the air shut-off valves are closed at rear of towing vehicle.

**b. Removal.** Remove the two stove bolts and three mounting bolts holding relay-emergency valve guard to semitrailer frame assembly. Shut off the air to semitrailer brake system by closing the two shut-off valves at rear of tractor. Open drain cock at underside of reservoir. Disconnect the air line from relay-emergency valve which is mounted on left side of vehicle. Remove the two screws which hold the valves to the tool compartment and pull the valve and copper tubing assembly out of tool compartment. Remove the tube connector body and nut from end of valve.

c. **Installation.** Tighten tube connector body into valve, and install tubing connector nut on connector body. Place valve and tubing assembly through hole in tool compartment with exhaust port down. Couple tube connector nut to connector body at relay-emergency valve. Install the two bolts holding valve assembly to tool compartment. Test for leaks (par. 231 c (2)). Place valve guard over tank and valve assembly, securing it to semitrailer decking by using two stove bolts and three cap screws.

## Section XXXVI

# ELECTRICAL SYSTEM

Paragraph
Description .......... 234
Testing lighting circuit .......... 235
Lights .......... 236
Junction box .......... 237
Fuse panel assembly .......... 238
Jumper cable socket .......... 239
Blackout switch .......... 240

## 234. DESCRIPTION.

**a.** The general electrical circuit diagram (fig. 302), illustrates all of the electrical circuits used on this vehicle. All electrical units are shown in their relative positions. Each wire in the electrical system is of a distinctive color. A key to these colors will be found on the circuit diagram. The wiring consists of several lengths of conduit and wire assemblies. Removal procedure for either of the assemblies is identical.

## 235. TESTING LIGHTING CIRCUIT.

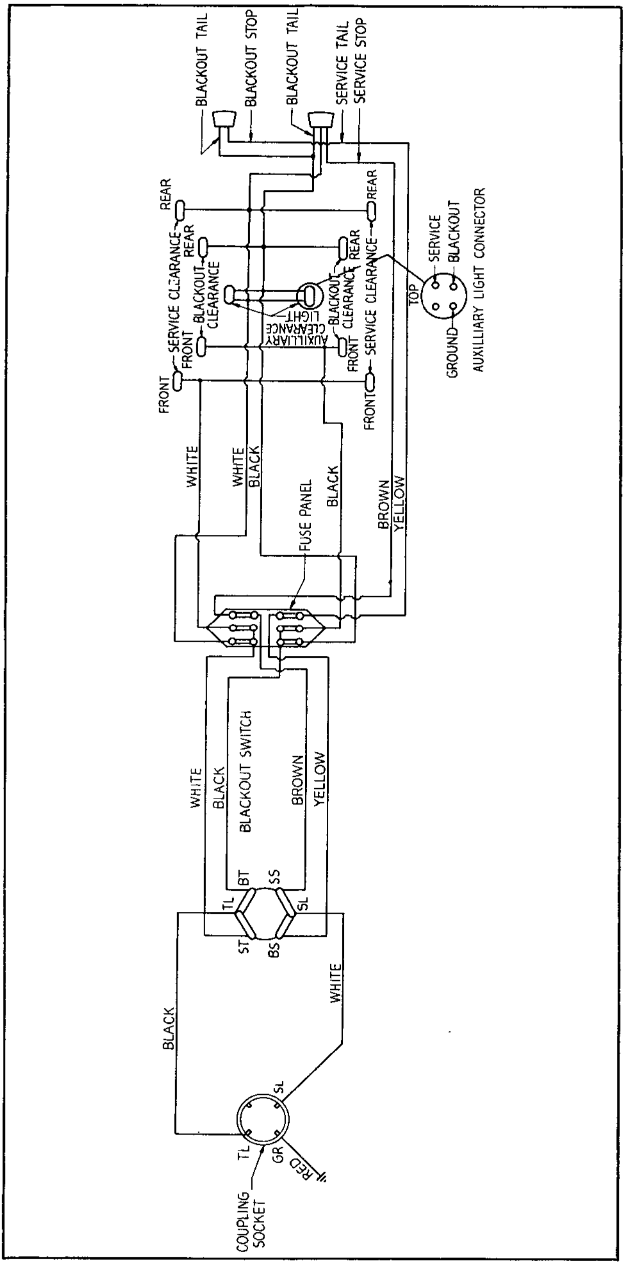
**a.** Battery and wiring system of towing vehicle will not be discussed in this section. Source of current will hereafter be considered as being the jumper cable socket at rear of towing vehicle. To locate trouble, start at the socket. The fundamental principle of trouble shooting is the elimination of one possible source of trouble after another until the trouble has been localized, as follows:

(1) Turn the light switch to the "ON" position. Place the foot brake in the "APPLIED" position. Test each light blade in socket at rear of towing vehicle with a low reading voltmeter or a test light. Assuming that there is a flow of current in each light blade, plug the jumper cable into the socket. Test the flow of current at the opposite end of jumper cable. If current flows through jumper cable it may be assumed the jumper cable is in good condition.

(2) Remove cap from light socket located in hole at front cross member of semitrailer. Cap and socket body extend through hole and project out at the top decking (fig. 305). Test each light terminal. (Light terminals are marked "SL" for stoplight, "G" for ground, "TL" for taillight, and "BK" for brake). Should current fail to flow through any of these terminals, it indicates a defective socket, or defective blade in socket which leads to the terminal. If current flows through the socket it indicates the socket is in good condition. Continue to make similar tests throughout the semitrailer until source of trouble is located. NOTE: *Terminal marked "BK" on light socket is dead.*

## 236. LIGHTS.

**a. Description.** The lighting equipment on this semitrailer includes four commercial clearance lights, four clearance blackout


BLACKOUT TAIL
BLACKOUT STOP
BLACKOUT TAIL
SERVICE TAIL
SERVICE STOP
REAR
SERVICE CLEARANCE
REAR
BLACKOUT CLEARANCE
REAR
BLACKOUT CLEARANCE
REAR
SERVICE CLEARANCE
AUXILLIARY CLEARANCE LIGHT
FRONT
SERVICE CLEARANCE
FRONT
FRONT
FRONT
TOP
SERVICE
BLACKOUT
GROUND
AUXILLIARY LIGHT CONNECTOR
WHITE
WHITE
BLACK
FUSE PANEL
BLACK
BROWN
YELLOW
WHITE
BLACK
BLACKOUT SWITCH
BROWN
YELLOW
BT
SS
TL
SL
ST
BS
BLACK
WHITE
SL
TL
GR
RED
COUPLING SOCKET

RA PD 57415

Figure 302—Schematic Wiring Diagram

lights, one combination blackout stoplight and blackout taillight, one combination service stop and service tail blackout taillight, and two movable auxiliary clearance light assemblies. The flow of current is controlled at light switch on towing vehicle. The combination service stop and taillight and blackout taillight is mounted at the left-hand rear of the semitrailer. The combination blackout stop and blackout taillight is mounted at the right-hand rear of the semitrailer. The lens on each blackout taillight is designed to produce two beams. This design is such that when one truck is following a preceding truck at a specified safe distance, these two beams will merge into a single highly visible light. To insure the accuracy of construction necessary to produce this effect, the lamp is soldered to the lens retainer, and the lens and filter are crimped to the retainer to form a complete unit. When the lamp is burned out, it is necessary to replace the complete sealed beam lamp-unit.

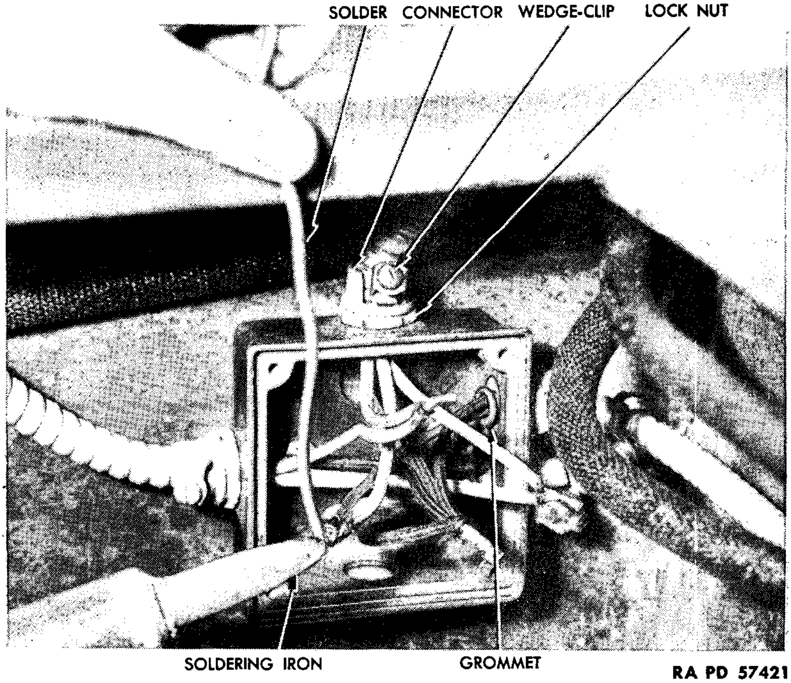


*Figure 303—Removing Junction Box*

**b. Taillight Sealed Beam Unit.**

(1) REMOVAL. Remove the two door screws. Remove the door and pull either unit, or both units, out of light housing.

(2) INSTALLATION. Install replacement unit. Replace door, securing same with the two door screws.

## 40-TON TANK TRANSPORTER TRUCK-TRAILER M25

### c. Clearance Lights.

(1) REMOVAL. Turn the two screws holding lens housing to light assembly in a counterclockwise direction until housing is free of light backing plate. Remove housing and gasket. Pull the two lens retainer clips toward outer edge of light housing and lift lens out. Remove the four screws from backing plate. Pull out backing plate. Remove tape from soldered joint, cut wire and pull assembly out. NOTE: *Removal procedure for both amber and blackout clearance lights is identical.*

(2) INSTALLATION. Clean all foreign matter from surface of pig tail and main wire which protrudes from semitrailer body. Splice the two wires together and solder. Wrap the soldered splice with rubber tape, then with friction tape. Place rubber gasket and backing plate into position and secure them to semitrailer using four screws. Place fibre gasket in position on light base; secure housing and lens assembly to backing plate using the two screws. NOTE: *When replacing blackout lens make certain the arrow on lens is pointing down and that the word "BOTTOM" is at the bottom of the light.*

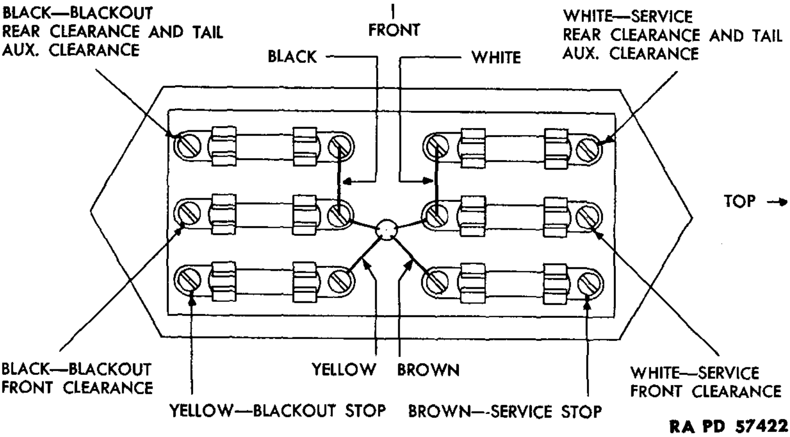

BLACK—BLACKOUT
REAR CLEARANCE AND TAIL
AUX. CLEARANCE
FRONT
BLACK
WHITE
WHITE—SERVICE
REAR CLEARANCE AND TAIL
AUX. CLEARANCE
TOP →
BLACK—BLACKOUT
FRONT CLEARANCE
YELLOW
BROWN
WHITE—SERVICE
FRONT CLEARANCE
YELLOW—BLACKOUT STOP
BROWN—SERVICE STOP
RA PD 57422

*Figure 304—Fuse Panel Diagram*

### d. Auxiliary Clearance Lights.

(1) REMOVAL. NOTE: *This unit is equipped with two amber and two blackout clearance lights. Removal procedure for both is identical.* Pry lock ring out of light body flange, remove lens and gasket, remove tape from soldered splice and melt solder using soldering iron. Remove body mounting nut and washer and pull assembly out of mounting bracket.

(2) INSTALLATION. Place light assembly through hole in mounting bracket, securing it to bracket using nut and lock washer. Clean all foreign matter from pig tail which extends from light body; also clean wire from main wire. Splice the two wires together and solder joint. Tape spliced joint with rubber tape, then with friction tape.

Paint tape with shellac. NOTE: *When installing lens in blackout light it will be noticed the lens is marked "TOP." Make certain the word "TOP" is at top of light after lens is installed.*

## 237. JUNCTION BOX.

**a. Description.** This is equipped with three junction boxes, one on top decking, one on left side of unit near front wheel, and one located on the rear cross member toward right side of unit. Removal of the three boxes is identical.

**b. Removal** (fig. 303). Remove four screws holding box cover plate. Remove all rubber tape and friction tape from each splice.

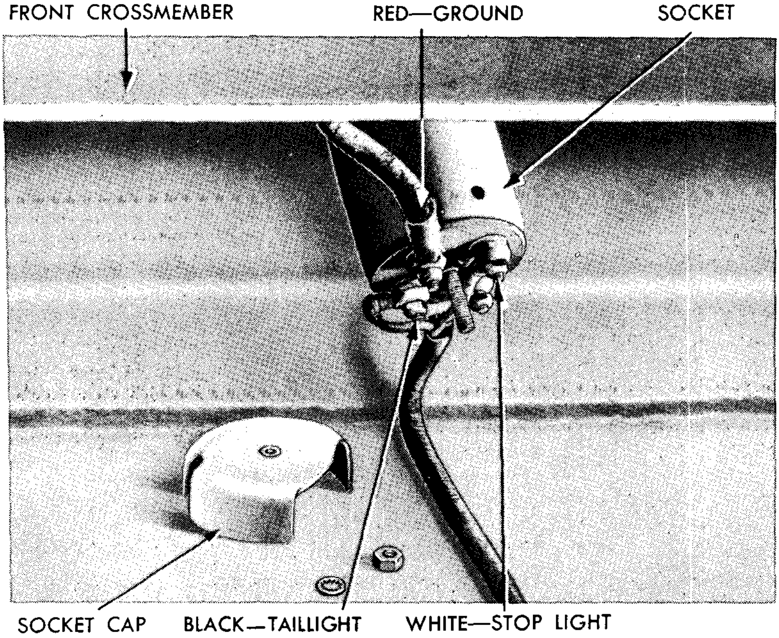


*Figure 305—Jumper Cable Light Socket—Cover Removed*

Separate each splice. NOTE: *Due to the limited amount of wire which protrudes from junction box, heat each splice to melt solder and separate the wires rather than cut them.* Remove screw from wedge clip; turn housing and lock nut off junction box. Pull each wire assembly and grommet out of junction box. Remove bolt holding box to frame member and lift out box.

**c. Installation.** Bolt junction box to frame member making certain inlets to box are adjacent to cable assembly. Place housing assembly over cable assembly, install grommet over wire ends, and place wires and grommet in inlet. Turn housing and lock nut assem-

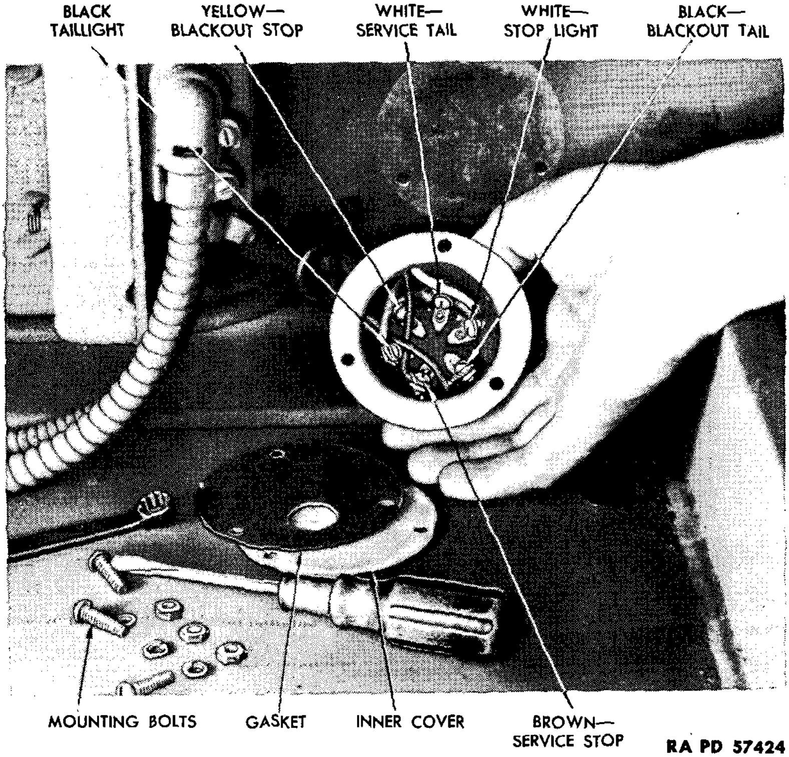

BLACK TAILLIGHT
YELLOW— BLACKOUT STOP
WHITE— SERVICE TAIL
WHITE— STOP LIGHT
BLACK— BLACKOUT TAIL
MOUNTING BOLTS
GASKET
INNER COVER
BROWN— SERVICE STOP
RA PD 57424

*Figure 306—Removing Blackout Switch*

bly down on inlets securing conduit to housing using wedge clips. Splice wires by twisting them together, matching black to black, brown to brown, etc. Solder each splice; insulate each splice using rubber tape, then friction tape. If shellac is available, give tape a coat of shellac. Fold all spliced wire into junction box and install cover plate.

## 238. FUSE PANEL ASSEMBLY.

**a. Removal** (fig. 304). Remove cotter pins from wing nut studs. Remove the two wing nuts and pull fuse panel cover off. Pull fuse out of retainer clips.

**b. Installation.** Install fuse into fuse clips. Place fuse panel cover on fuse panel securing cover to panel using two wing nuts and cotter pins. NOTE: *Each fuse and wire is marked as to color of wire and lights that each fuse controls. Should any of the lights fail to light, inspect and replace burned out fuses.*

## 239. JUMPER CABLE SOCKET.

**a. Removal.** Remove nut holding socket cap to body (fig. 305). Remove nuts from each terminal and lift washer, terminal cup and wires, off terminals. Remove four bolts holding socket to semitrailer cross member and pull socket out from rear side of cross member.

**b. Installation.** Install socket and bolt in place with four bolts. Install wire, terminal washer, and nut on each terminal. Place socket cap in place and fasten with nut. Clean all points of contact before making connections. Tighten terminal nuts securely.

## 240. BLACKOUT SWITCH.

**a. Removal.** Remove three screws holding switch to cross member. Remove wires from each terminal. Pull each wire out of switch body. Lift switch out.

**b. Installation.** Place switch in position. Place wire through holes in side of switch body making certain grommet is inserted in hole in body. Connect each wire to terminals in inner side of switch (fig. 306).

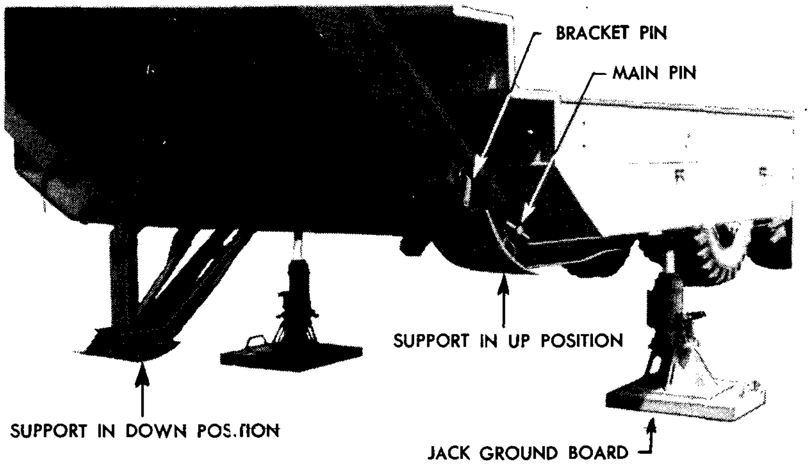
## Section XXXVII

# SUPPORTS

Paragraph
Description ........ 241
Removal ........ 242
Installation ........ 243

## 241. DESCRIPTION.

**a.** The supports are of a combination fold-back, swing type. The support legs are fastened to the underside of the semitrailer frame at the drop section. The supports are braced laterally and longitudinally. The complete assembly consists of two major parts, strut and leg.



RA PD 57425

*Figure 307—Semitrailer Supports*

## 242. REMOVAL (fig. 307).

**a.** CAUTION: *Do not attempt to work on supports unless semitrailer is properly jacked up at front, or unless semitrailer is coupled to towing vehicle.*

(1) Place support in the "DOWN" position. Remove cotter pin from main pin assembly, and pull pin out of bracket and lower leg assembly to ground.

(2) Remove cotter pin from bracket pin and pull pin out of brackets, placing support strut in the "DOWN" position. Loosen set screw at top of support strut and drive hinge pin out. Place screwdriver in slot of lock rings at the two hinge pins and pry lock ring off hinge pins. Drive out the hinge pins and remove leg assembly.

## 243. INSTALLATION.

**a.** Place support leg in position under semitrailer with leg and foot assembly toward front of unit. Raise rear end of leg assembly and fasten leg to brackets using pins and lock ring. Place strut assembly between mounting bracket. Place a light film of grease over hinge pin and install pin through support strut and mounting bracket. Secure hinge pin to strut, using set screws and lock nut. Fasten strut brace, using hinge pin and lock ring.

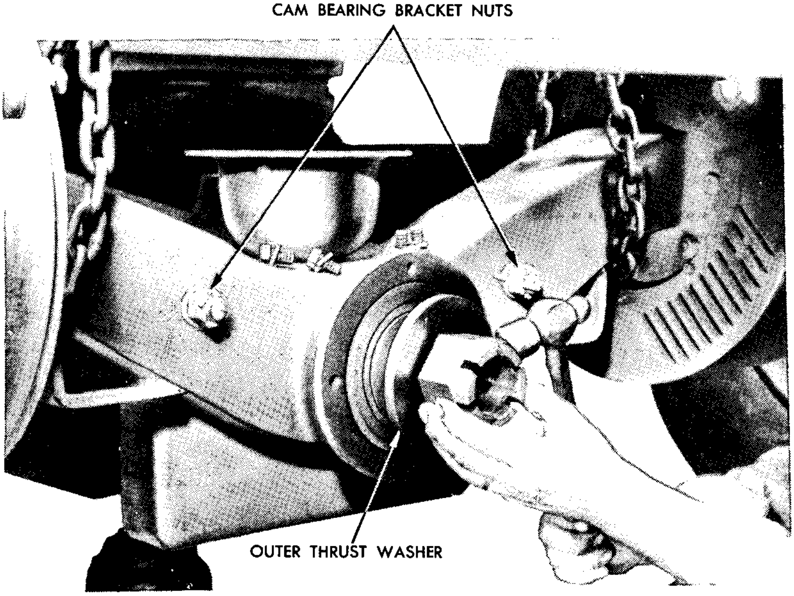
## Section XXXVIII

# TRUNNION AXLE

Paragraph
Description ........ 244
Removal ........ 245
Installation ........ 246

## 244. DESCRIPTION.

**a.** The unit is equipped with four trunnion type axles which oscillate on a spindle at each end of the walking beam, thus permitting the wheels to oscillate in transverse and longitudinal directions. This construction allows one wheel to pass over a 9-inch obstacle with the other three wheels remaining on the ground.



RA PD 57429

*Figure 308—Removing Trunnion Axle Nut*

## 245. REMOVAL.

**a. Remove Trunnion Axle.** Erect crane and hoist assembly (par. 10); place hoist in hoist pocket. Hoist pocket is located between the front and rear wheels on the right and left side of main frame. Using two ground boards, two jack pedestals, and two 20-ton hydraulic jacks, jack semitrailer frame until wheels clear ground. Place two jacks under walking beam to prevent walking beam from moving. Remove the inner and outer wheel and hub assembly from trunnion axle (par. 252). Move crane and hoist assembly so that the trolley hoist is directly over trunnion axle. Fasten chain to hoist with the two ends straddling the frame side rail. Fasten chain to trunnion axle at both ends. Pull cotter pin and rod end pins from the two equalizer links which control the brakes on trunnion axle (fig. 291). Remove the four cap screws holding cap to trunnion axle. Remove cotter pin from nut and remove nut and thrust washer (fig. 308). Pull trunnion axle off walking beam (fig. 309). Install axle nut on the two axle spindles and walking beam spindle to prevent threads from becoming damaged through handling.

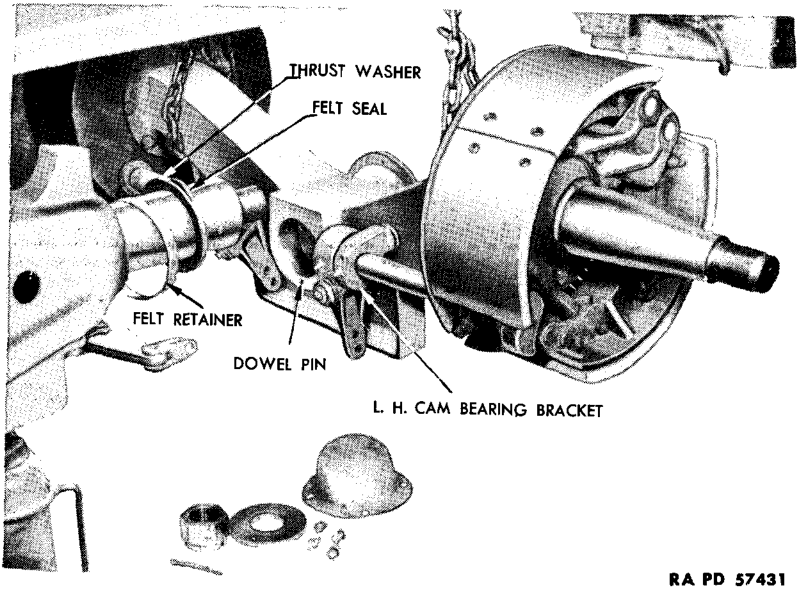


*Figure 309—Trunnion Axle Removed*

**b. Remove Brake Assembly.**

(1) Remove lock nuts and flat washer from the two camshafts and tap slack adjusters off cam. Mark an "L" on the left-hand brake assembly, and an "R" on the right-hand assembly for identification when installing. Remove eight bolts holding brake adapter mounting plate to axle flange on both sides. Lift the complete assembly off axle (fig. 310).

(2) Remove the cotter pin, nut and flat washer from the two bearing brackets, and drive brackets out of trunnion axle (fig. 311).

## 246. INSTALLATION.

**a. Brake Assembly.**

(1) Place the right-hand and left-hand cam bearing brackets into cam bearing bracket holes in trunnion axle. Cam bearing brackets are

furnished in right- and left-hand brackets. Cam bearing bracket illustrated in figure 311 is of the right-hand type.

(2) Install washer and nut, but do not tighten nut. Install brake assembly onto the trunnion axle spindle. Make certain you place the assembly marked "L" on the left side, and the assembly marked "R" on the right side. These markings "L" and "R" are made on brake assemblies at the time of disassembly.

(3) Place the cam through cam bracket. Install the eight bolts holding brake assembly to axle collar. Successively tighten opposite nuts to bring brake mounting plate up evenly, and prevent cocking of adapter on brake mounting flange.

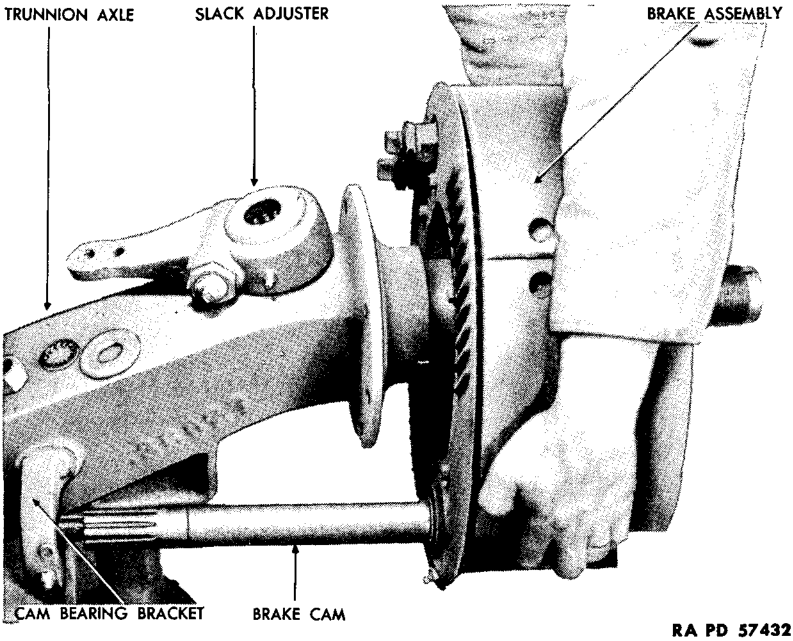
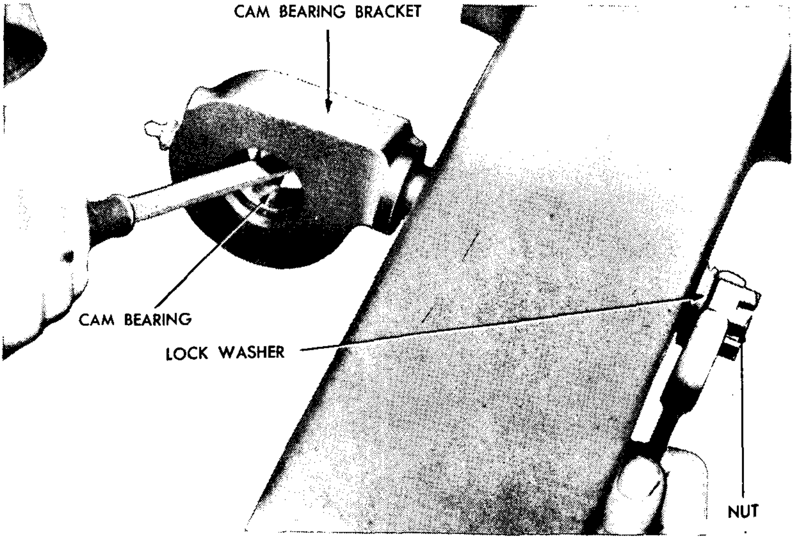


*Figure 310—Removing Internal Brake Assembly*

(4) Place bearing over cam, and tap the bearing into the cam bearing bracket. Place slack adjuster on cam (fig. 309). Install flat washer, and double lock nuts, and tighten nut. CAUTION: *Try moving slack adjuster by hand. Make certain it moves freely.* If there is any bind felt between slack adjuster and cam bracket, tap cam bracket until bind is eliminated. Tighten nut on cam bearing bracket.

**b. Install Trunnion Axle.** Place felt retainer over spindle. Place inner thrust washer on spindle and felt seal next to thrust washer. Install dowel pin in trunnion axle. Clean all dust and other foreign matter from walking beam spindle, and place a light film of grease over its surface. Place trunnion axle on walking beam spindle, making certain dowel pin hole in trunnion axle meets and fits into dowel pin in thrust washer (fig. 309).

(1) Place a light film of grease over inner surface of outer thrust washer and install thrust washer over spindle. Install nut and tighten by turning nut in a clockwise direction. After nut has been tightened, release the nut ½ turn and install cotter pin. Place small amount of grease into hub cap and secure hub cap to trunnion axle, using four cap screws and lock washers.



RA PD 57433

*Figure 311—Removing Cam Bearing Bracket*

(2) Connect the two equalizer links to the slack adjuster, using two rod end pins and two cotter pins. Install the two wheel and tire assemblies (par. 252 b).

(3) Prior to placing unit into operation, lubricate the trunnion axle by means of lubrication fitting. Place several drops of oil on rod end pins in equalizer link, and give brakes on trunnion axle a minor brake adjustment (par. 221).

## Section XXXIX

## WALKING BEAM

| | Paragraph |
|---|---|
| Description | 247 |
| Removal | 248 |
| Installation | 249 |
| Adjustment | 250 |

### 247. DESCRIPTION.

**a.** The semitrailer is equipped with two walking beams, one on the right side and one on the left side. They are hinged to the side rails by a mounting bracket and a trunnion shaft permitting the walking beam to move in a longitudinal direction. Brake cylinders are housed in the hollow section on the walking beam to furnish maximum protection to these vital parts. Removal and installation procedures of either of the two walking beams is identical. Both walking beams are identical in construction and are interchangeable.

### 248. REMOVAL (fig. 312).

**a. Remove Trunnion Axle.** Remove the two trunnion axles from both ends of rocker beam (par. 245). Remove brake cylinder carrier assembly (par. 223 **b**).

**b. Remove Shifting Screw.**

(1) Place two jacks under walking beam about three feet apart, one on the outer side and the other on the inner side. Remove the four screws holding felt dust cover to trunnion beam mounting bracket (fig. 313). Loosen shifting screw locking bolt (fig. 26). Remove the screw holding weather strip mounting plate at end, and both sides, of trunnion mounting bracket. Remove the cotter pin located on inner side of shifting bracket. Loosen pinch bolt in special nut located on inner side of shifting bracket, and pull cotter pin out of special nut.

(2) Remove the four screws holding boot and shifting screw guard to cross member. Loosen the clamp, holding boot to shifting bracket, and pull boot off shifting screw. Turn shifting screw out of trunnion shaft. NOTE: *This is a two-man operation.* With one man holding special nut from turning (fig. 314), the second man turns shifting screw out of the shifting bracket and trunnion shaft (fig. 315).

(3) Remove the cap screws holding shifting screw bracket to walking beam, and lift the bracket out. Remove the special nut, bronze washer, spacer, and felt washer from shifting bracket (fig. 312).

**c. Remove Trunnion Shaft.** Remove the four nuts holding inner trunnion shaft mounting bracket cap, and tap cap off the trunnion shaft. Remove two outer bolts holding outer trunnion shaft mounting bracket cap to mounting bracket (fig. 316). Lower the two jacks under rocking beam, and pull dowel pin out of trunnion shaft (fig. 317). Pull trunnion shaft out of walking beam.

**d. Remove Walking Beam.** Lower the two jacks. Lift walking beam out.

## 249. INSTALLATION.

**a. Installing Brake Carrier Assembly.** Place rocker beam on floor with hollow section up. Lay brake cylinder carrier assembly on top of rocker beam making certain the air ports in brake cylinder are facing toward the side that has the five bolt holes for attaching shifting screw bracket.

**b. Mount Walking Beam.** Place walking beam directly under semitrailer side rail, making certain the holes, which hold shifting bracket to rocker beam, are toward center of semitrailer. Couple portable trolley hoist to rocker beam using a spread chain straddling the semitrailer side rail. NOTE: *When coupling chain to rocker beam place chain in such a manner as not to cause chain to bind between walking beam and under side of semitrailer side rail.*

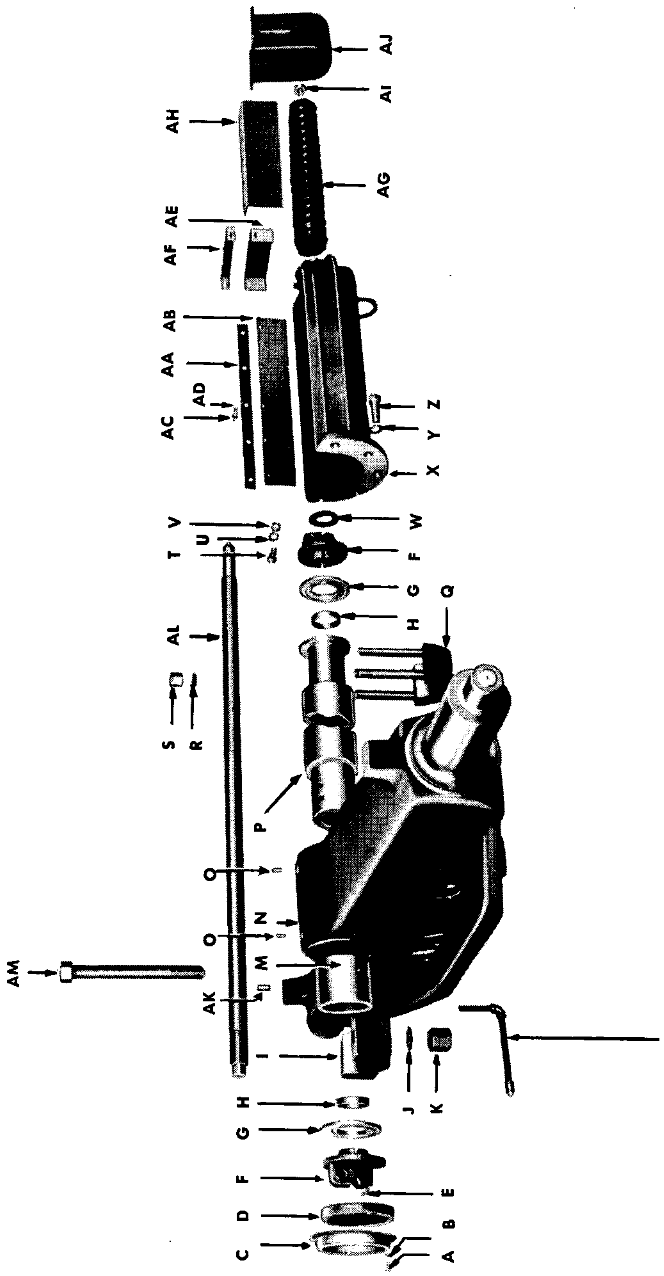
**c. Install Trunnion Shaft.** Place a film of grease over surface of trunnion shaft and place trunnion shaft through walking beam making certain the oil and dowel pin hole in trunnion shaft is toward the outer side of semitrailer and toward the top. Hoist walking beam approximately one inch from trunnion shaft mounting bracket. Install the dowel pin (fig. 318). CAUTION: *The trunnion shaft is equipped with two holes. Make certain the dowel pin is installed in hole that is toward center of semitrailer.* The hole toward outer side of trunnion shaft is an oil hole.

**d. Bolt Trunnion Shaft in Position.** Continue hoisting walking beam until dowel pin in trunnion shaft enters hole in trunnion shaft mounting bracket. Place outer trunnion shaft mounting bracket cap over trunnion shaft making certain the two screw holes that hold dust felt cover to assembly are toward the outer side of semitrailer. Secure cap using the two bolts, nuts, and lock washers. Place inner trunnion shaft mounting bracket cap over trunnion shaft, securing cap to mounting bracket with four nuts and lock washers.

**e. Install Shifting Screw.**

(1) Bolt the shifting bracket to inner side of rocker beam using five cap screws and lock washers. Place shifting screw through hole in trunnion shaft making certain spacer and bronze washer are placed over shifting screw prior to installation (fig. 312). NOTE: *Inner and outer bronze washers, spacers, and special locking nuts are interchangeable throughout the semitrailer.*

(2) Place spacer and bronze washer over inner end of shifting screw. Hold the special inner nut in place through space between trunnion shaft mounting bracket and trunnion bracket with the machined surface toward rocker beam. Turn shifting screw slowly in a clockwise direction. Continue turning shifting screw through shifting


AJ
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RA PD 57471

Figure 312—Walking Beam and Shifting Screw Assembly—Exploded View

A 1/4 INCH ROUND HEAD SLOTTED SCREW
B 1/4 INCH LOCK WASHER
C DUST FELT COVER
D DUST FELT
E 3/16 INCH x 2 1/2 INCH COTTER PIN
F SPECIAL NUT
G TRUNNION SHAFT WASHER
H SPACER
I OUTSIDE TRUNNION SHAFT CAP
J LOCK WASHER
K CAP BOLT NUT
L WALKING BEAM BUSHING LUBRICATION LINE
M WALKING BEAM BUSHING
N WALKING BEAM (ROCKER ARM)
O BUSHING DOWEL PIN
P TRUNNION SHAFT
Q TRUNNION SHAFT CAP AND STUDS
R LOCK WASHER
S NUT
T 7/16 INCH CAP SCREW

U 7/16 INCH LOCK WASHER
V 7/16 INCH CASTELLATED NUT
W FELT WASHER
X SHIFTING BRACKET
Y 3/4 INCH LOCK WASHER
Z 3/4 INCH CAP SCREW
AA SIDE WEATHER STRIP MOUNTING PLATE
AB SIDE WEATHER STRIP
AC 5/16 INCH CAP SCREW
AD 5/16 INCH LOCK WASHER
AE END WEATHER STRIP
AF END WEATHER STRIP MOUNTING PLATE
AG SHIFTING SCREW RUBBER BOOT
AH PROTECTION PLATE
AI RETAINER COLLAR
AJ U-BRACKET
AK TRUNNION SHAFT DOWEL PIN
AL WALKING BEAM SHIFTING SCREW
AM TRUNNION SHAFT CAP NUT

RA PD 57471B

***Legend for Figure 312—Walking Beam and Shifting Screw Assembly—Exploded View***

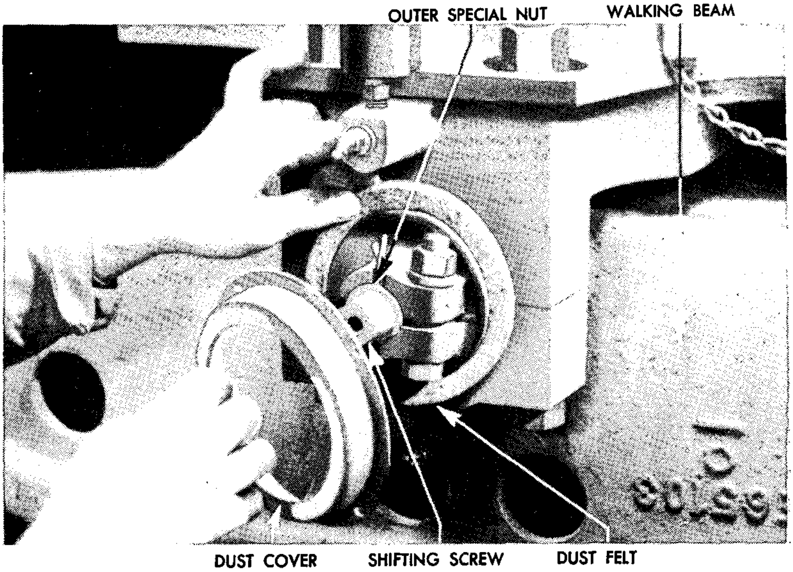

OUTER SPECIAL NUT
WALKING BEAM
DUST COVER
SHIFTING SCREW
DUST FELT
RA PD 57436

*Figure 313—Removing Dust Cover and Dust Felt*

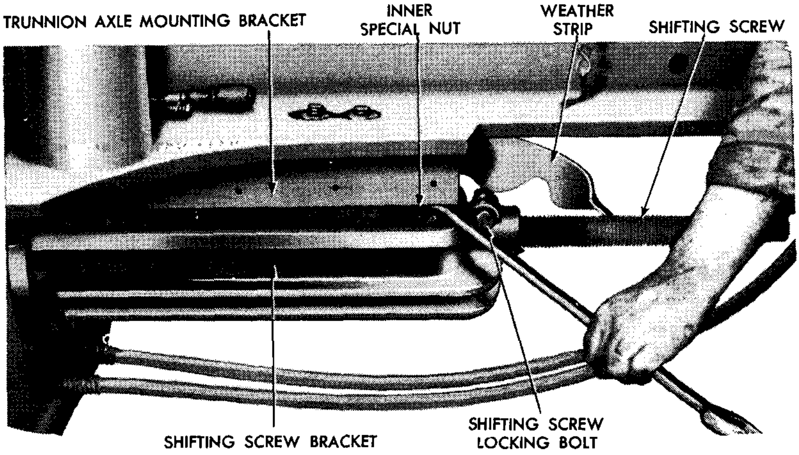
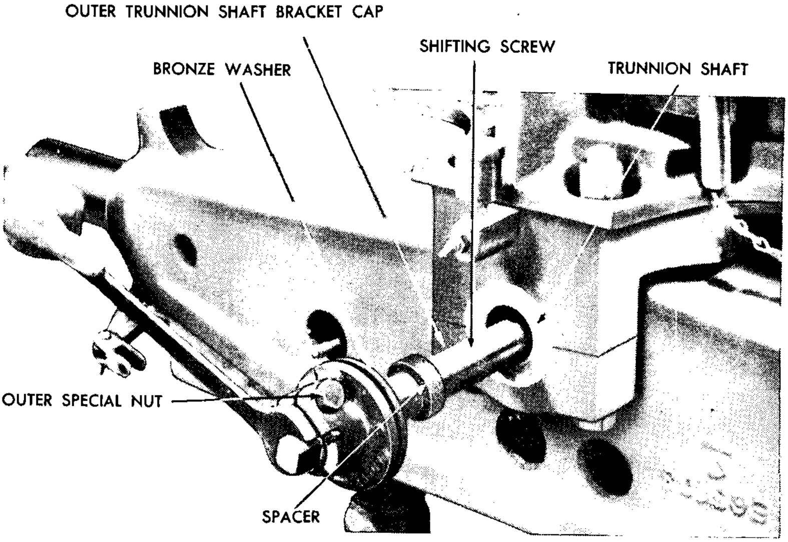

TRUNNION AXLE MOUNTING BRACKET
INNER SPECIAL NUT
WEATHER STRIP
SHIFTING SCREW
SHIFTING SCREW BRACKET
SHIFTING SCREW LOCKING BOLT
RA PD 57437

*Figure 314—Holding Special Nut*

## WALKING BEAM


OUTER TRUNNION SHAFT BRACKET CAP
SHIFTING SCREW
BRONZE WASHER
TRUNNION SHAFT
OUTER SPECIAL NUT
SPACER

RA PD 57438

*Figure 315—Removing Shifting Screw*

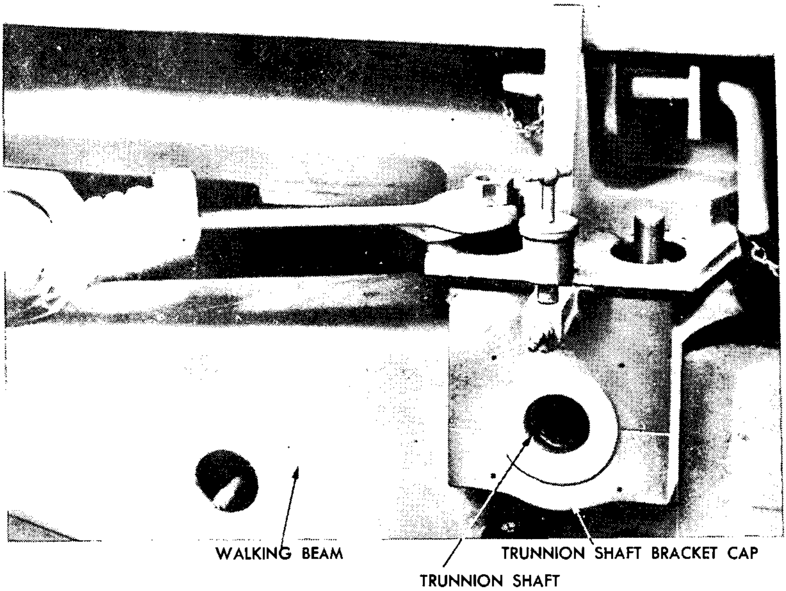

WALKING BEAM
TRUNNION SHAFT BRACKET CAP
TRUNNION SHAFT

*Figure 316—Removing Trunnion Shaft Bracket Cap*

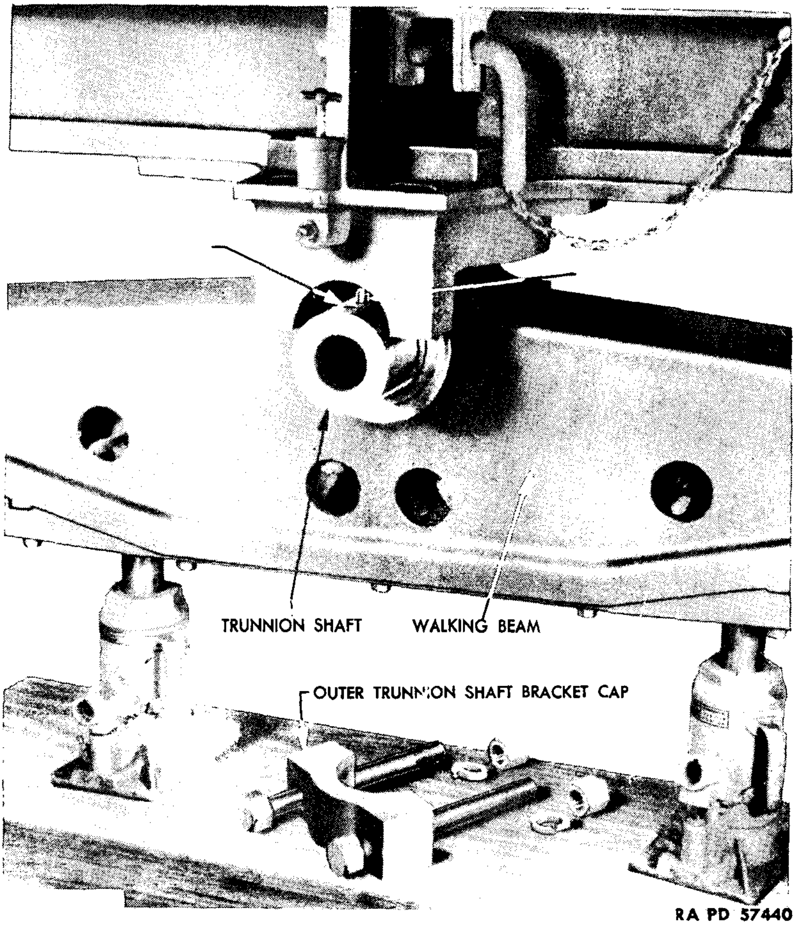


*Figure 317—Trunnion Shaft and Walking Beam*

screw bracket until it extends through shifting bracket about 15 inches. Place rubber boot over shifting screw. Install boot retainer collar over end of shifting screw. Continue turning the shifting screw until end of screw contacts center of U-bracket. Turn inner special nut until slot in nut is in alinement with cotter pin hole in shifting screw, and install cotter pin.

(3) Install the side and end weather strips, securing them to trunnion shaft mounting bracket with plates and cap screws. Place dust felt in position over outer end of trunnion shaft, securing it to trunnion shaft mounting bracket with felt dust cover and four screws (fig. 313).

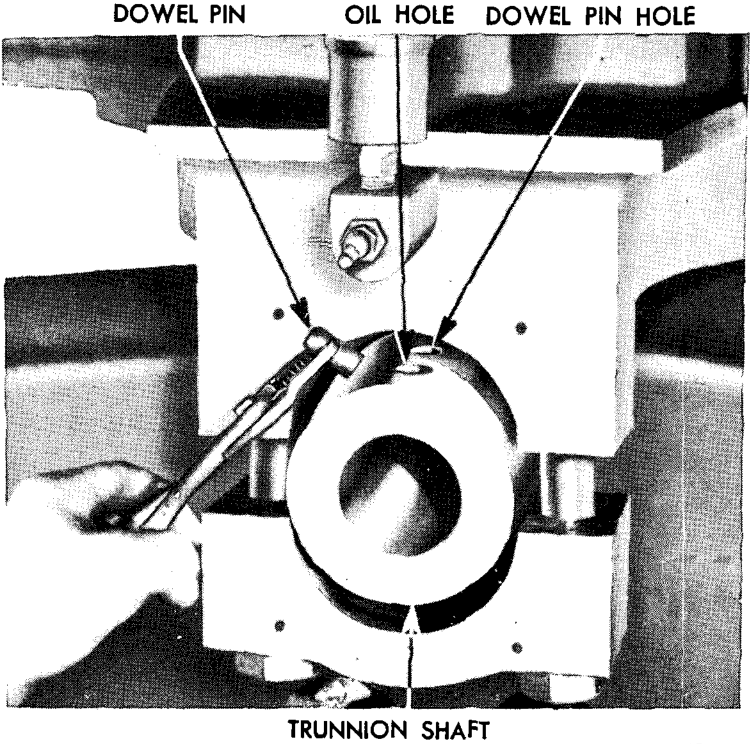


*Figure 318—Installing Dowel Pin in Trunnion Shaft*

(4) Prior to tightening shifting screw locking bolt, check adjustment of walking beam on trunnion axle (par. 250). Prior to placing semitrailer into operation, lubricate trunnion shaft, trunnion axle and linkage.

**f. Install Trunnion Axles.** Install trunnion axles (par. 246 **b**). Couple equalizer links and give minor adjustment (par. 221).

## 250. ADJUSTMENT.

**a.** Place jack ground board, jack pedestal and hydraulic jack at rear of semitrailer frame and raise the frame an inch or two to relieve part of weight off front and rear wheel assemblies.

**b.** Loosen the shifting screw locking bolt (fig. 26), with shifting screw wrench. Turn screw in a clockwise direction until stop is reached. Turn screw in a counterclockwise direction about $\frac{1}{2}$ turn, or until there is $\frac{1}{32}$-inch clearance between outer side of walking beam at bushing and trunnion shaft mounting bracket. Check clearance by inserting feeler gage between these two points.

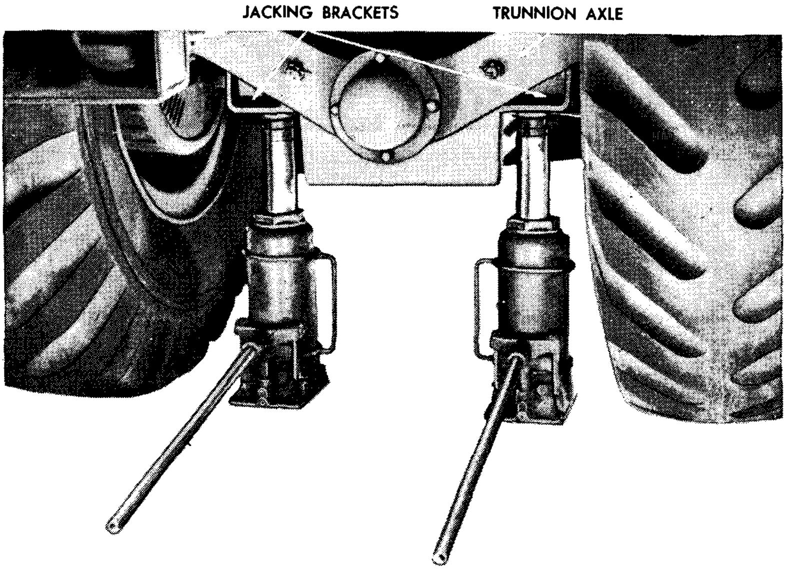
## Section XL

# WHEELS, HUBS, AND TIRES

Paragraph
Description .......... 251
Wheel and hub assembly .......... 252
Hub bearing adjustment .......... 253
Wheels .......... 254
Hub and drum assembly .......... 255
Tires .......... 256

## 251. DESCRIPTION.

**a. Description.** The vehicle is equipped with eight wheels, hubs, and tires. The axle and wheels are equipped with heavy duty tapered roller bearings. Simple adjustments of the bearings are made through the castellated nut and D-washer. The wheels are of the ten-stud, demountable, ventilated steel disk type. All maintenance procedure on either of the wheel and hub assemblies is identical, except when removing the two inner rear wheels. When removing the inner rear wheels remove the idler pulley carrier assembly. All wheels and bear-



RA PD 57442

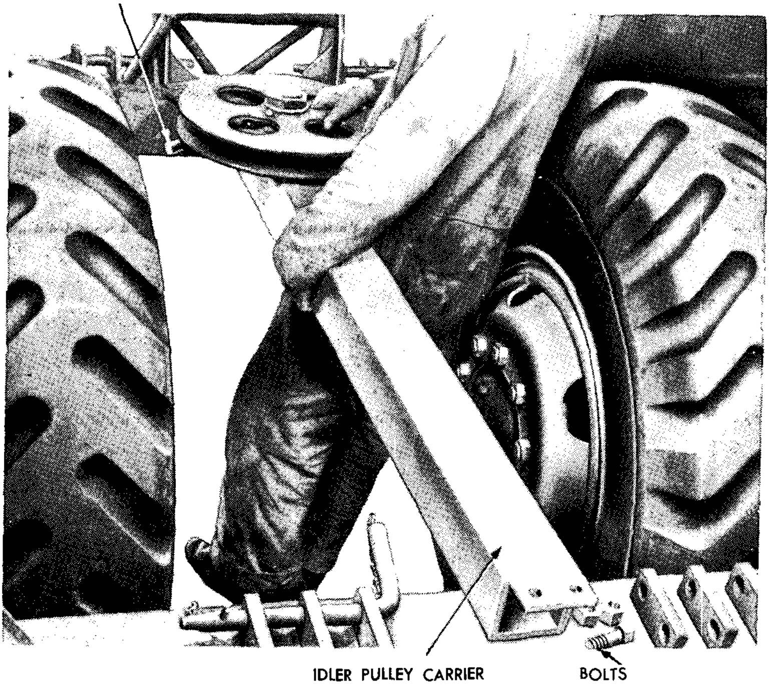
*Figure 319—Trunnion Axle Jacking Brackets*

ings are interchangeable. The hubs are interchangeable from front to rear, but not from right to left. The wheel and hub can be removed as one assembly.

## 252. WHEEL AND HUB ASSEMBLY.

### a. Removal.

(1) Place two 20-ton jacks under trunnion axle and raise semitrailer high enough to permit turning of wheel. NOTE: *Trunnion axle is provided with two jacking brackets. Place jack cap under jacking brackets to prevent slippage* (fig. 319). If jacks are used in soft soil or sand, place jack ground board under jack. Remove the two bolts and pin holding idler pulley carrier assembly to rear cross member and second member (fig. 320), and lift idler pulley carrier out.



RA PD 57443

*Figure 320—Removing Idler Pulley Carrier*

(2) Erect crane and hoist assembly (par. 10). Place hoist assembly in hoist pocket adjacent to the wheel assembly which is to be removed. Place tire tongs into hook on chain hoist, and fasten tongs to tire.

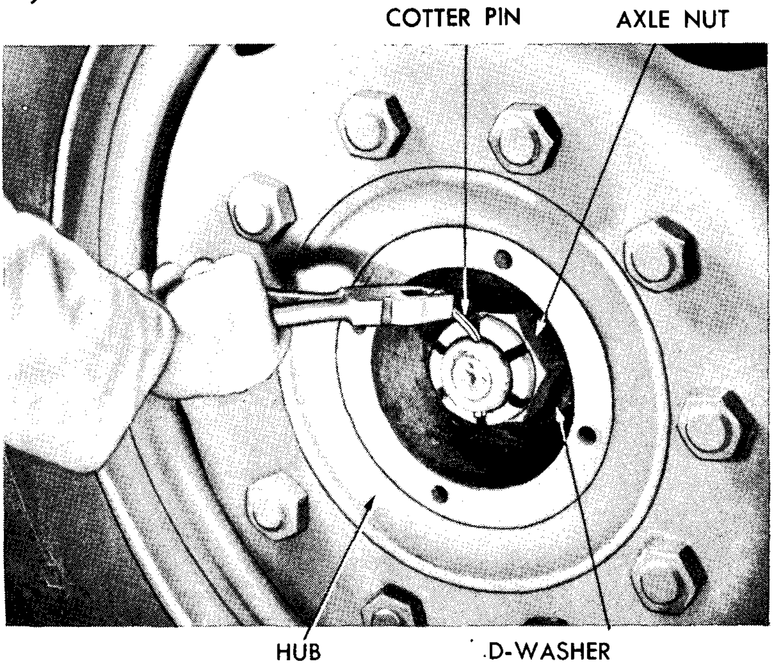
(3) Remove the four screws holding hub cap to hub assembly.

(4) Pull cotter pin from axle nut (fig. 321). Remove axle nut with axle nut wrench by turning in a counterclockwise direction. Place screwdriver under D-washer and work washer off axle spindle.

(5) Place screwdriver under outer bearing and work bearing off spindle.

(6) Take a slight pull on chain hoist, grasp the wheel firmly and pull the assembly off axle (fig. 322).

(7) Pull inner bearing, compression ring, and felt, off spindle (fig. 323).



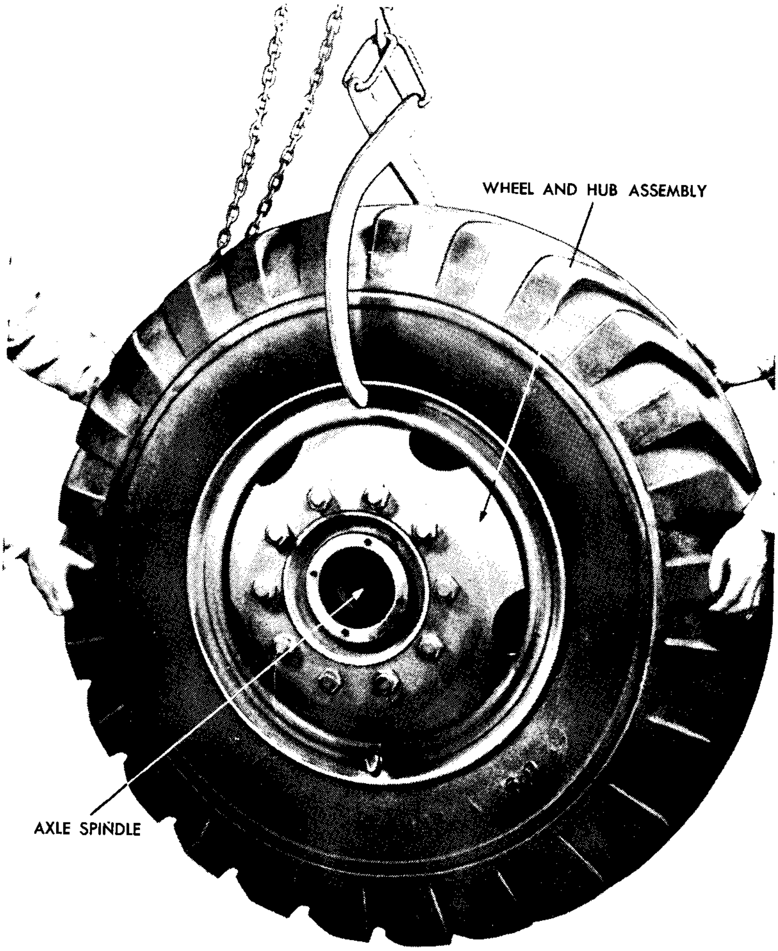
RA PD 57444

*Figure 321—Removing Axle Cotter Pin*

**b. Installation.**

(1) Before installing wheel and hub assembly wash the inner and outer bearings in dry-cleaning solvent. Use a stiff brush to remove all hardened grease. Wash inside of hub. Inspect the cups in hub for cracks, chipped surface, and pits. Inspect bearings for chipped rollers, pits, and excessive wear. Clean all foreign matter from inside of brake drum.

(2) Hand-pack bearing with general purpose grease No. 2, U. S. Army Specification 2-108. Knead the lubricant in between rollers. Coat the outer surface of roller cage and bearing cone. Coat the inside surface of hub and bearing cups with a film of grease not exceeding ⅛ inch thick. Coat trunnion axle and hub cap with light film of



RA PD 57445

***Figure 322—Removing Wheel and Hub Assembly as One Unit***

grease. CAUTION: *Do not pack the space between the two bearing cups. Excess grease in hub will cause grease to run out on brake drum.*

(3) NOTE: *Do not install wheel on axle spindle with felt retainer and compression ring on axle spindle.* Place inner bearing in hub. Insert compression ring next to inner bearing with its flanged side toward the inside of hub. Place the felt grease retainer next to compression ring. Place the dust collar on the axle spindle, locking it in position by means of the metal dowel which fits into slot on spindle flange and into hole in dust collar (figs. 323 and 324).

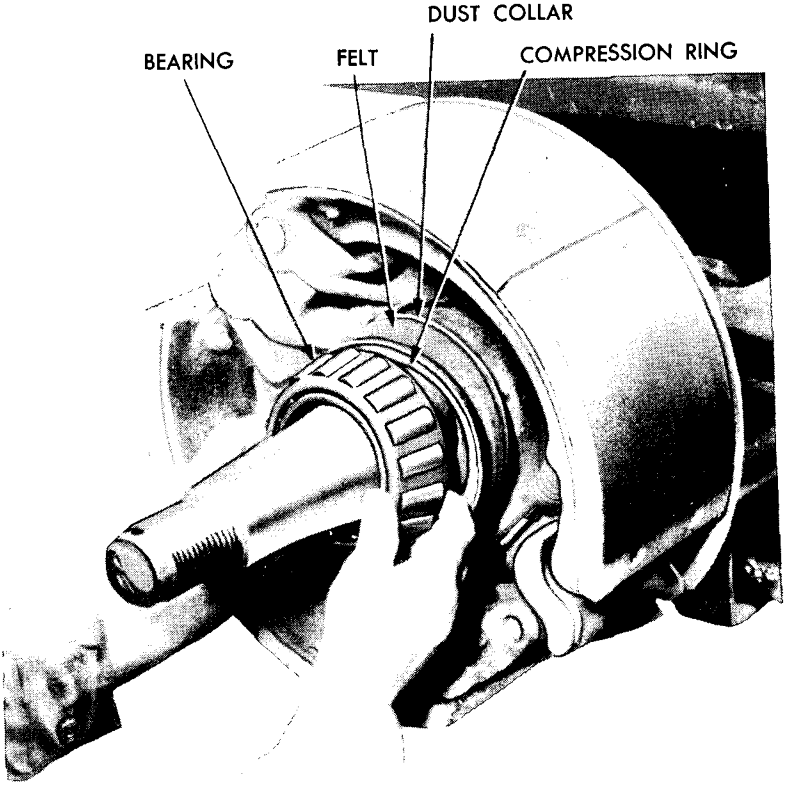


*Figure 323—Removing Inner Hub Bearing from Trunnion Spindle*

(4) Suspend wheel and hub assembly from crane and hoist. Shove hub on spindle, making certain not to disturb the setting of inner bearing, felt, and dust collar.

(5) Install outer bearing, forcing it back into hub as far as possible. Place the D-washer over spindle next to outer bearing (fig. 325). Place axle nut on spindle and turn in a clockwise direction until nut is tight. Remove crane and hoist. Adjust wheel bearings (par. 253 **b**). Remove jacks and jack ground boards.

## 253. HUB BEARING ADJUSTMENT.

### a. Check for Loose Wheel Bearings.

(1) Check to make sure brakes are in fully released position, and that wheel stud nuts are tight.

(2) Jack up axle to free the wheel to be worked on. Check end adjustment by lifting with a crowbar between tire and floor. Should the wheel feel loose, adjust bearing (par. 253 **b**).

**b. Adjustment.** Remove the four screws holding hub cap to hub. Pull cotter pin from axle nut. With the wheel bearing wrench draw up the axle nut tightly against D-washer and turn the wheel back and forth until a slight bind is felt and the wheel turns with slight difficulty. Back off on axle nut about ½ turn. Install cotter pin and hub cap.

## 254. WHEELS.

**a.** The outer and inner wheel assemblies are removed from vehicle without the use of crane and hoist assembly which is furnished with this vehicle. The crane and hoist are used only on inner wheel assemblies when it becomes necessary to hoist wheel out from between side rail members to change tires. The following removal and installation instructions are devoted to maintenance of inner rear wheels.

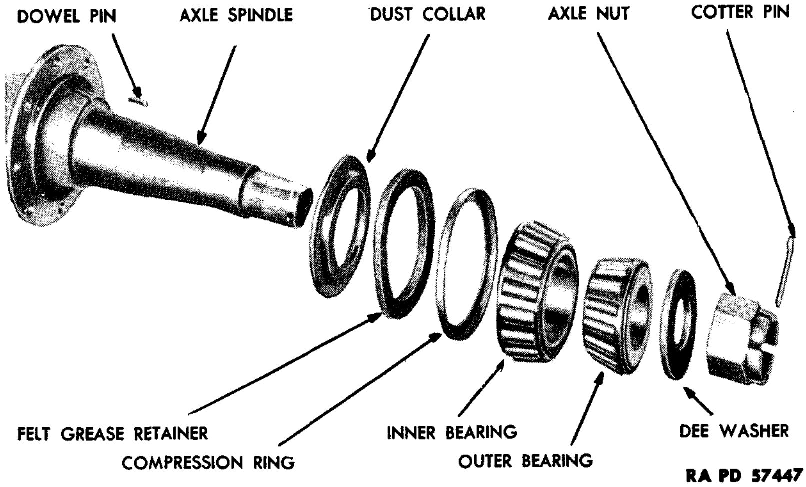


*Figure 324—Assembly Sequence of Hub Inner Parts*

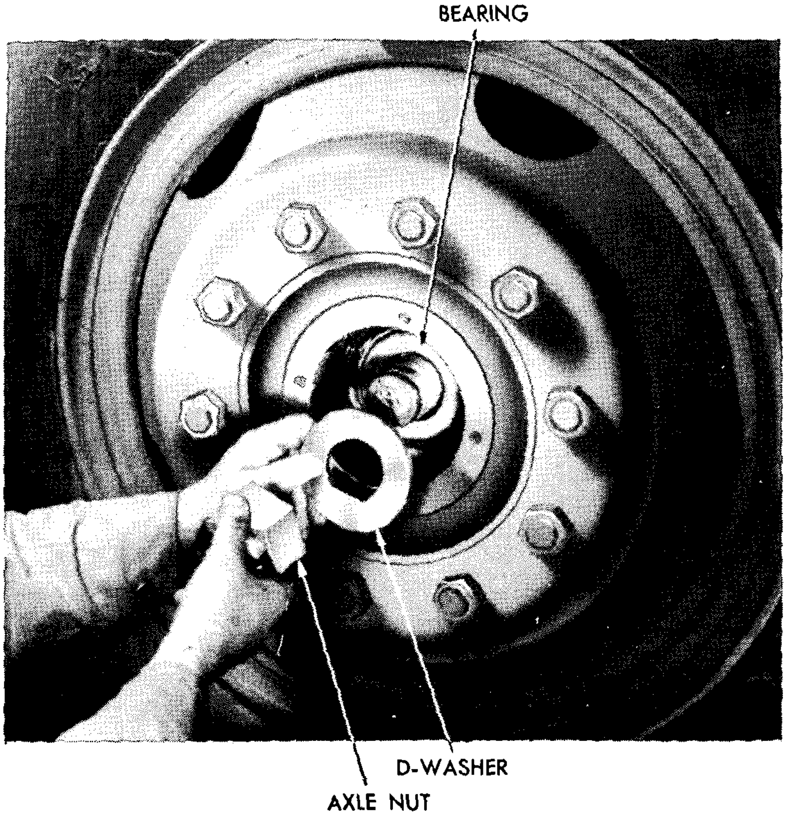
**b. Removal.**

(1) Remove the two bolts and one pin holding idler pulley carrier assembly to rear cross member and remove idler pulley carrier (fig. 320).

(2) Erect hoist and crane assembly (par. 10). NOTE: *Prior to installing hoist into hoist pocket, place a light film of grease over inner surface of hoist pocket to aid in swinging crane more freely.*

(3) Place hoist and crane assembly in hoist pocket adjacent to wheel which is to be removed. Fasten tire tongs to tire and take a slight strain on hoist.

(4) Remove 10 wheel stud nuts holding wheel to hub assembly (fig. 326). Pull wheel off hub studs. Hoist wheel high enough to clear semitrailer side rail. Push hoist around toward outside of semitrailer



RA PD 57452

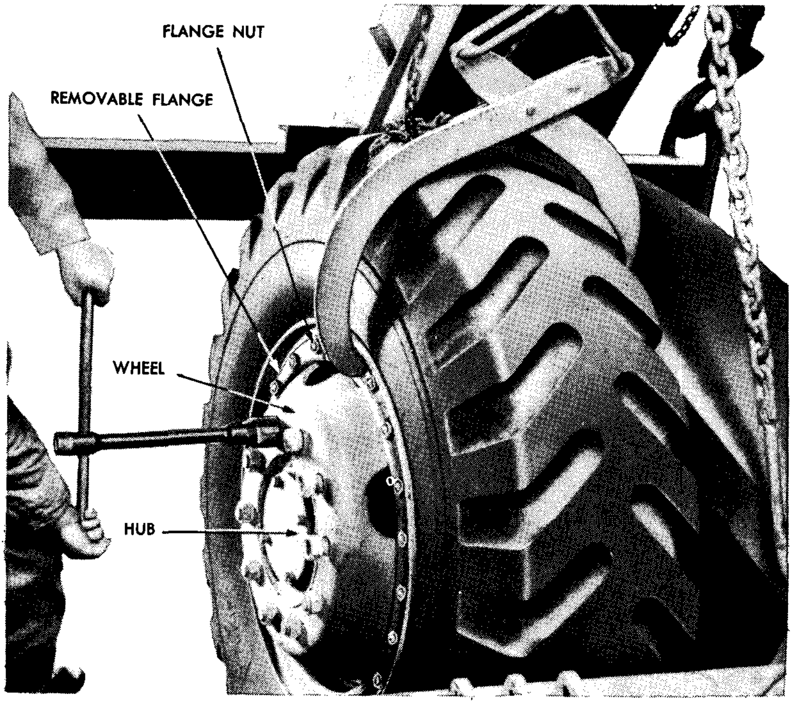
**Figure 325—Installing Outer Bearing and D-washer**

and lower tire and wheel to ground (fig. 327). CAUTION: *Do not remove the 20 nuts holding removable flange to wheel. Tire will blow out and cause serious injury.*

**c. Installation.**

(1) Erect hoist and crane assembly (par. 10). Place hoist and crane assembly in pocket adjacent to hub on which wheel is to be installed.

(2) Hoist wheel into position over wheel studs in hub. Install and draw up stud nuts, applying pressure evenly on all nuts by progressively tightening opposite nuts until all nuts are tight. NOTE: *All studs and nuts are marked with the letters "L" or "R" which indicate right and left. Studs and nuts are not interchangeable. Wheels are interchangeable.*



RA PD 57448

***Figure 326—Removing Rear Inner Tire and Wheel Assembly***

## 255. HUB AND DRUM ASSEMBLY.

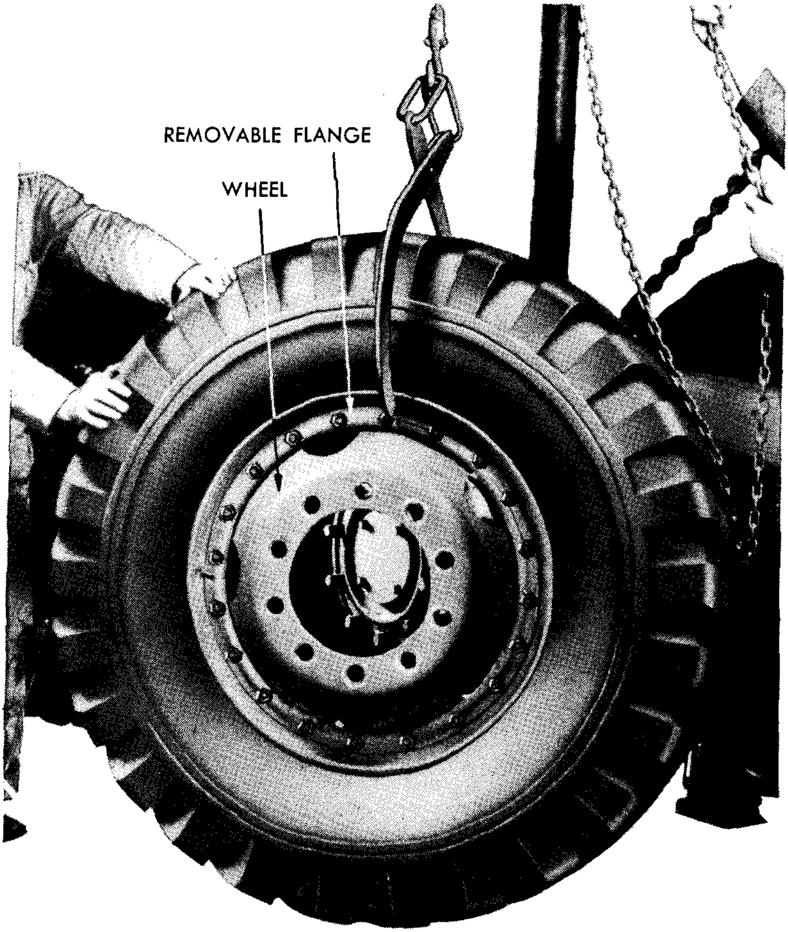
### a. Removal.

(1) JACKING TRAILER. NOTE: *Make certain brakes are in the full released position.* Place two 20-ton jacks under trunnion axle and raise semitrailer high enough to permit turning of wheel (fig. 319). If jacks are used on soft ground or sand, place jacks on ground board.

(2) REMOVE WHEEL AND TIRE ASSEMBLY (par. 254). Remove four hub cap screws and hub cap. Pull cotter pin from axle nut (fig. 321), and remove axle nut by turning in a counterclockwise direction with axle nut wrench.

(3) Work D-washer and outer bearing from hub by pulling out on hub with a short jerking motion. Pull hub off axle spindle (fig. 328).

(4) Pull inner bearing, compression ring and felt grease retainer off axle spindle (fig. 323).



RA PD 57449

*Figure 327—Lifting Rear Inner Tire and Wheel Assembly*

**b. Removing Drum from Hub.** Place hub on its side, remove the six bolts holding drum to hub flange and lift drum off hub (fig. 329).

**c. Installing Drum on Hub.** Place hub on outer end with flange up. Remove all dust, rust, and other foreign matter from surface of drum pilot. Place drum over drum pilot and install the six bolts, lock washers, and nuts. Successively tighten opposite nuts to bring drum down evenly, to prevent its cocking on hub pilot.

**d. Installation.** Installation of hub and drum assembly is the same as installation of wheel and hub assembly (par. 252 **b**).

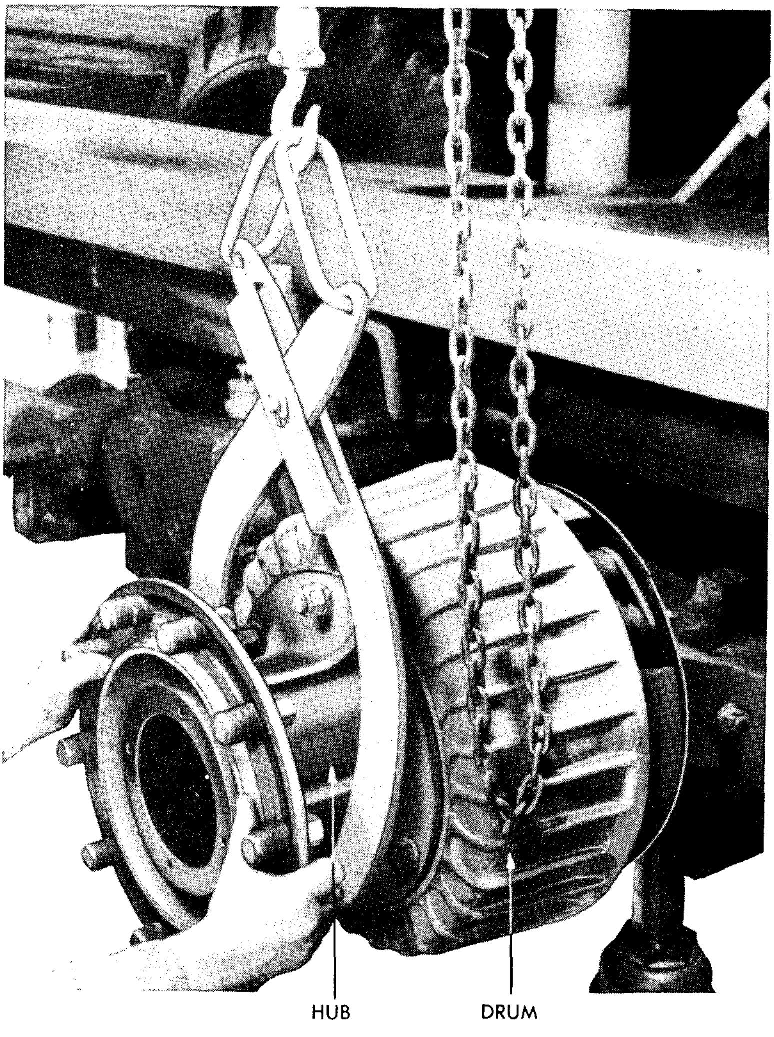


*Figure 328—Removing Hub and Drum Assembly*

(1) Adjust wheel bearings (par. 253 **b**).

(2) Install wheel (par. 254 **c**).

## 256. TIRES.

**a. Description.** The pneumatic type tires are held to wheel by removable flange bolted to wheel. Tires are interchangeable throughout trailer. Tire pressure in all tires must be 90 pounds.

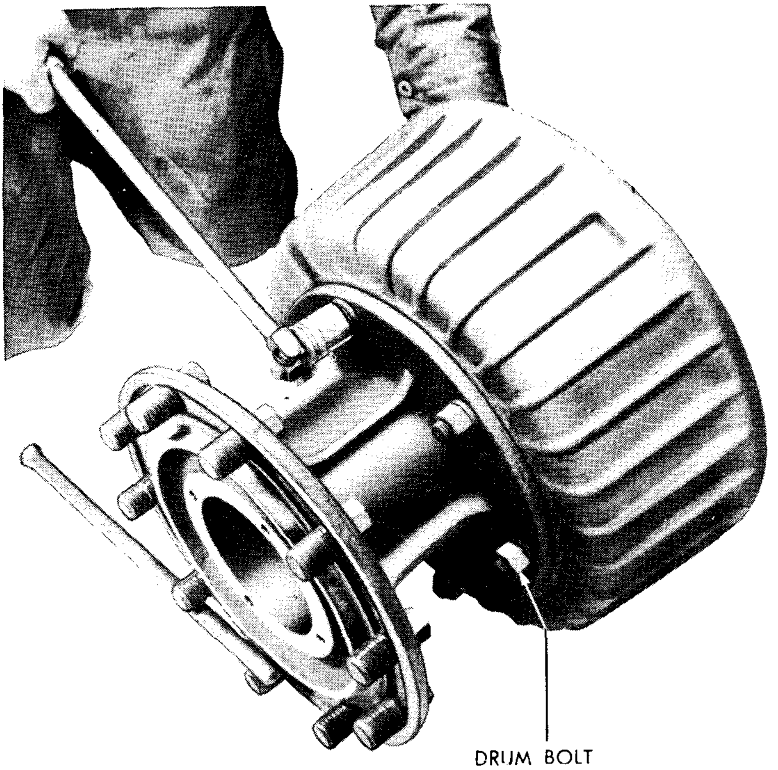
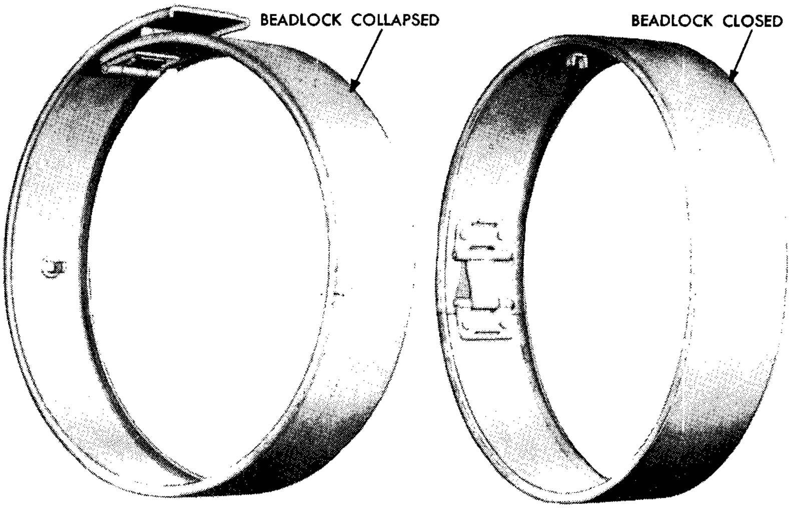


*Figure 329—Removing Drum from Hub*

**b. Removal.** Remove wheel and tire assembly from hub (par. 254). Place wheel and tire assembly on ground with removable flange up. CAUTION: *Deflate tire before removing nuts holding removable flange.* Remove valve core to permit all air to escape. Remove the 20 nuts holding removable flange to wheel. Lift removable flange off wheel and studs. Lift side of tire opposite valve off ground at about a 45-degree angle. Tap wheel lightly with sledge hammer, driving wheel free of tire. Place tire tool between bead lock, collapsing bead lock. Turn bead lock crosswise to tire and pull bead lock out of tire.

**c. Installation.** Remove sand, gravel, and other foreign matter from inside tire. Place completely deflated tube in tire. Inflate tube with sufficient air to spread tire bead. Collapse bead lock (fig. 330). Hold tire in vertical position and insert bead lock in tire (fig. 331). Rotate bead lock to position, and snap it into its original shape (fig. 332). Remove valve core to completely deflate tube. Apply tire assem-


BEADLOCK COLLAPSED
BEADLOCK CLOSED

RA PD 57453

*Figure 330—Bead Lock Collapsed and Closed*

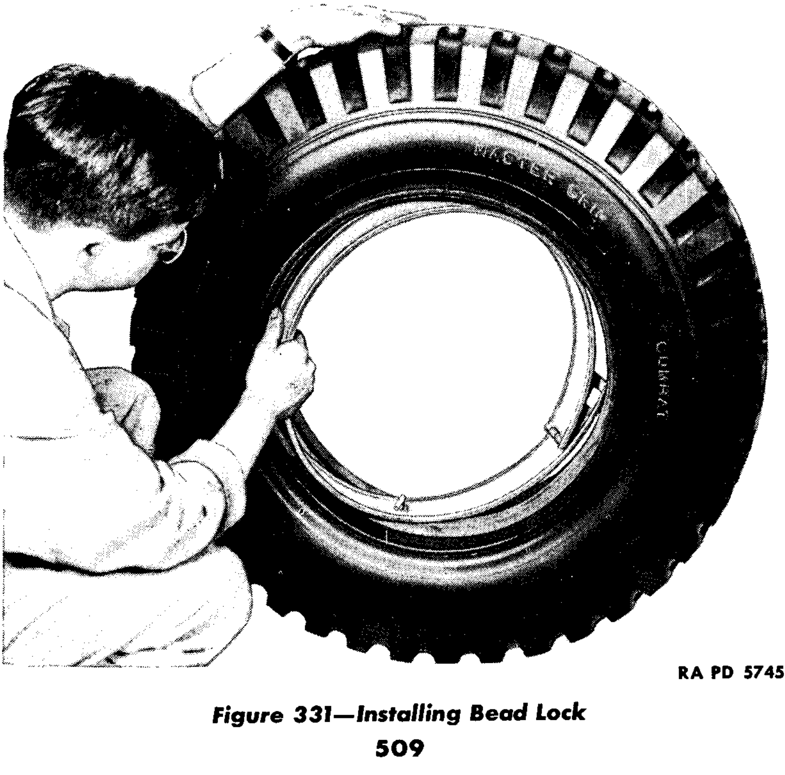


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*Figure 331—Installing Bead Lock*

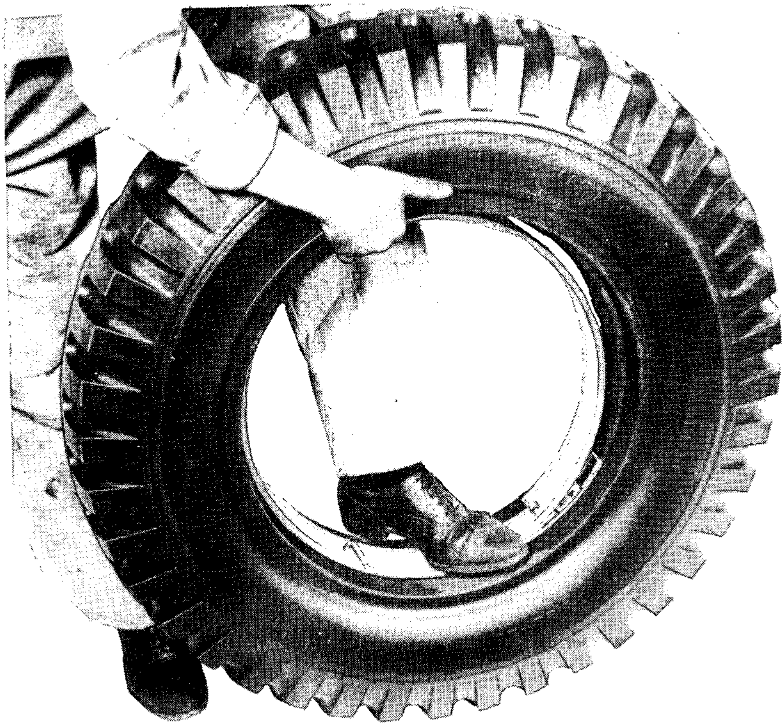


*Figure 332—Locking Bead Lock*

bly to the wheel with the valve stem toward removable flange side of wheel (fig. 333). Install removable flange so that holes are in proper alinement. Place crowbar between wheel and removable flange and pry down. Install the 20 nuts, screwing them down by hand (fig. 334). Then, with wrench, screw down one nut fairly tight. Tighten stud nut directly opposite. Tighten stud nut midway beween these two and the one directly opposite. Continue tightening remainder of stud nuts around flange. Install valve core. Inflate tire to 90 pounds pressure. Check stud nuts once more to make certain they are tight.

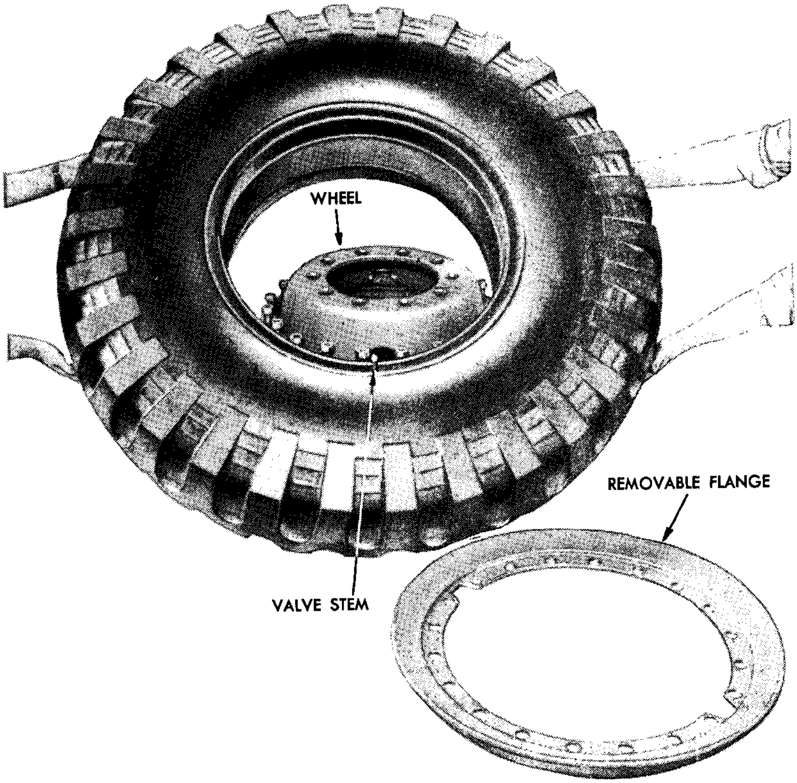

WHEEL
REMOVABLE FLANGE
VALVE STEM
RA PD 57456

*Figure 333—Mounting Tire on Wheel*

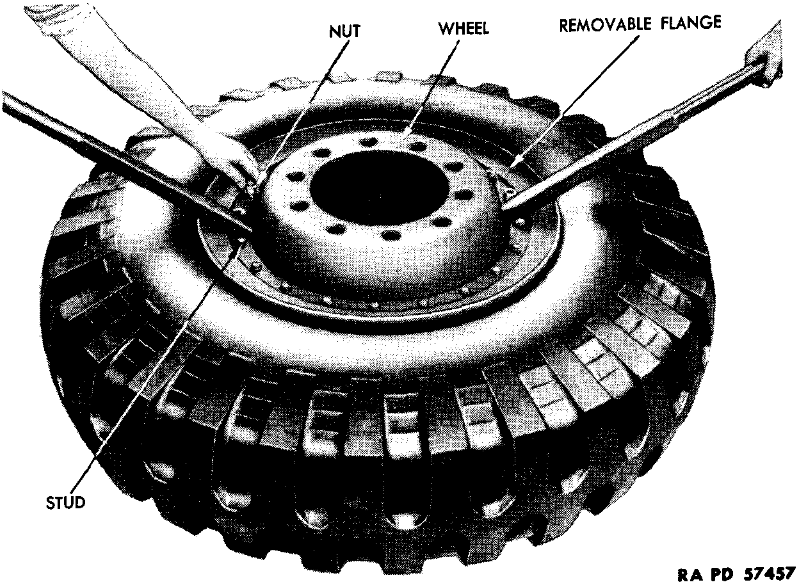

NUT
WHEEL
REMOVABLE FLANGE
STUD
RA PD 57457

*Figure 334—Installing Removable Flange*

# PART FOUR—SHIPMENT AND TEMPORARY STORAGE

## Section XLI

## SHIPMENT AND TEMPORARY STORAGE

Paragraph
General instructions .................................... 257
Preparation for temporary storage or domestic shipment...... 258
Loading and blocking for rail shipment..................... 259

### 257. GENERAL INSTRUCTIONS.

**a.** Preparation for domestic shipment of the vehicles is the same as preparation for temporary storage or bivouac. Preparation for shipment by rail includes instructions for loading and unloading the vehicles, blocking necessary to secure the vehicles on freight cars, number of vehicles per freight car, clearance, weight, and other information necessary to properly prepare the vehicles for rail shipment. For more detailed information, and for preparation for indefinite storage, refer to AR 850-18.

### 258. PREPARATION FOR TEMPORARY STORAGE OR DOMESTIC SHIPMENT.

**a.** Vehicles to be prepared for temporary storage or domestic shipment are those ready for immediate service, but not used for less than thirty days. If vehicles are to be indefinitely stored after shipment by rail, they will be prepared for such storage at their destination.

**b.** If the vehicles are to be temporarily stored or bivouacked, take the following precautions:

(1) LUBRICATION. Lubricate the vehicles completely (par. 30).

(2) COOLING SYSTEM. If freezing temperature may normally be expected during the limited storage or shipment period, test the coolant with a hydrometer and add the proper quantity of antifreeze compound, to afford protection from freezing at the lowest temperature anticipated during the storage or shipping period. Completely inspect the cooling system for leaks.

(3) BATTERY. Check battery and terminals for corrosion and if necessary, clean and thoroughly service battery (par. 127).

(4) TIRES. Clean, inspect, and properly inflate all tires. Replace with serviceable tires, all tires requiring retreading or repairing. Do not store vehicles on floors, cinders, or other surfaces which are soaked with oil or grease. Wash off immediately any oil, grease, gasoline, or kerosene which comes in contact with the tires under any circumstances.

(5) ROAD TEST. The preparation for limited storage will include a road test of at least five miles, after the battery, cooling system, lubrication, and tire services have been made, to check on general condition of the vehicles. Correct any defects noted in the vehicle

operation, before the vehicles are stored, or note on a tag attached to the steering wheel, stating the repairs needed, or describing the condition present. A written report of these items will then be made to the officer in charge.

(6) FUEL IN TANKS. It is not necessary to remove the fuel from the tanks for shipment within the United States, nor to label the tanks under Interstate Commerce Commission Regulations. Leave fuel in the tanks except when storing in locations where Fire Ordinances, or other local regulations, require removal of all gasoline before storage.

(7) EXTERIOR OF VEHICLE. Remove rust appearing on any part of vehicle exterior with sandpaper. Repaint painted surfaces whenever necessary to protect wood or metal from deterioration. Exposed polished metal surfaces which are susceptible to rust, such as winch cables and chains, should be coated with a protective medium grade lubricating oil. Close firmly all cab doors, windows, and windshields. Leave rubber mats, such as floor mats, where provided, in an unrolled position on the floor, and not rolled or curled up. Equipment, such as Pioneer and truck tools, tire chains, and fire extinguishers, will remain in place in the vehicle.

(8) INSPECTION. Make a systematic inspection just before shipment or temporary storage, to insure all above steps have been covered, and that the vehicles are ready for operation on call. Make a list of all missing or damaged items and attach it to the steering wheel. Refer to Before-operation Service (par. 25).

(9) ENGINE. To prepare the engine for storage, remove the air cleaner from the carburetor. Start the engine and set the throttle to run the engine at a fast idle. Pour one pint of medium grade, preservative lubricating oil, Ordnance Department Specification AXS-674, of the latest issue in effect, into the carburetor throat, being careful not to choke the engine. Turn off the ignition switch as quickly as possible after the oil has been poured into the carburetor. With the engine switch off, open the throttle wide, and turn the engine five complete revolutions by means of the cranking motor. If the engine cannot be turned by the cranking motor with the switch off, turn it by hand, or disconnect the high-tension lead and ground it before turning the engine by means of the cranking motor. Then reinstall the air cleaner.

(10) BRAKES. Release brakes and chock the wheels or tracks.

**c. Inspections in Limited Storage.**

(1) Vehicles in limited storage will be inspected weekly for condition of tires and battery. If water is added when freezing weather is anticipated, recharge the battery with a portable charger or remove the battery for charging. Do not attempt to charge the battery by running the engine. If freezing temperature is expected, add the proper quantity of antifreeze compound to cooling system to afford protection from freezing.

## 259. LOADING AND BLOCKING FOR RAIL SHIPMENT.

**a. Preparation.** In addition to the preparation described in paragraph 258, when ordnance vehicles are prepared for domestic shipment, the following preparations and precautions will be taken:

(1) EXTERIOR. Cover the body of the truck tractor with a canvas cover supplied as an accessory.

(2) TIRES. Inflate pneumatic tires from 5 to 10 pounds above normal pressure.

(3) BATTERY. Disconnect the battery to prevent its discharge by vandalism or accident. This may be accomplished by disconnecting the positive lead, taping the end of the lead, and tying it back away from the battery.

(4) BRAKES. The brakes must be applied and the transmission placed in low gear, after the vehicle has been placed in position with a brake wheel clearance of at least 6 inches ("A," fig. 335). The vehicles will be located on the car in such a manner as to prevent the car from carrying an unbalanced load.

(5) SHIFTING TRAILER ROCKER BEAM. Move semitrailer wheels to their innermost position (par. 5) before loading it on a flat car.

(6) PLACARDING. All cars containing ordnance vehicles must be placarded "DO NOT HUMP."

**b. Facilities for Loading.** Whenever possible, load and unload vehicles from open cars under their own power, using permanent end ramps and spanning platforms. Movement from one flat car to another along the length of the train is made possible by cross-over plates or spanning platforms. If no permanent end ramp is available, an improvised ramp can be made from railroad ties.

**c. Securing Vehicles (Tractor).**

(1) METHOD 1 (fig. 335). Locate eight blocks "B," one to the front, and one to the rear of each front wheel, to the front of each forward rear wheel, and to the rear of each rearward rear wheel. Nail the heel of each block to the car floor, using five 40-penny nails to each block. That portion of the block under the wheel will be toenailed to the car floor with two 40-penny nails to each block. Locate two cleats "D" against the outside face of each wheel. Nail the lower cleat to the car floor with three 40-penny nails and the top cleat to the cleat below with three 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the bumper lug on the front of the vehicle and through stake pockets on opposite sides of the freight car. Pass also the same number of strands of wire through the pintle hook on the rear of the vehicle and then attach to stake pockets on opposite sides of the freight car. Tighten all wires enough to remove slack.

(2) METHOD 2 (fig. 335). Locate four blocks "G," one to the front and one to the rear of the front wheels, one to the front of the forward

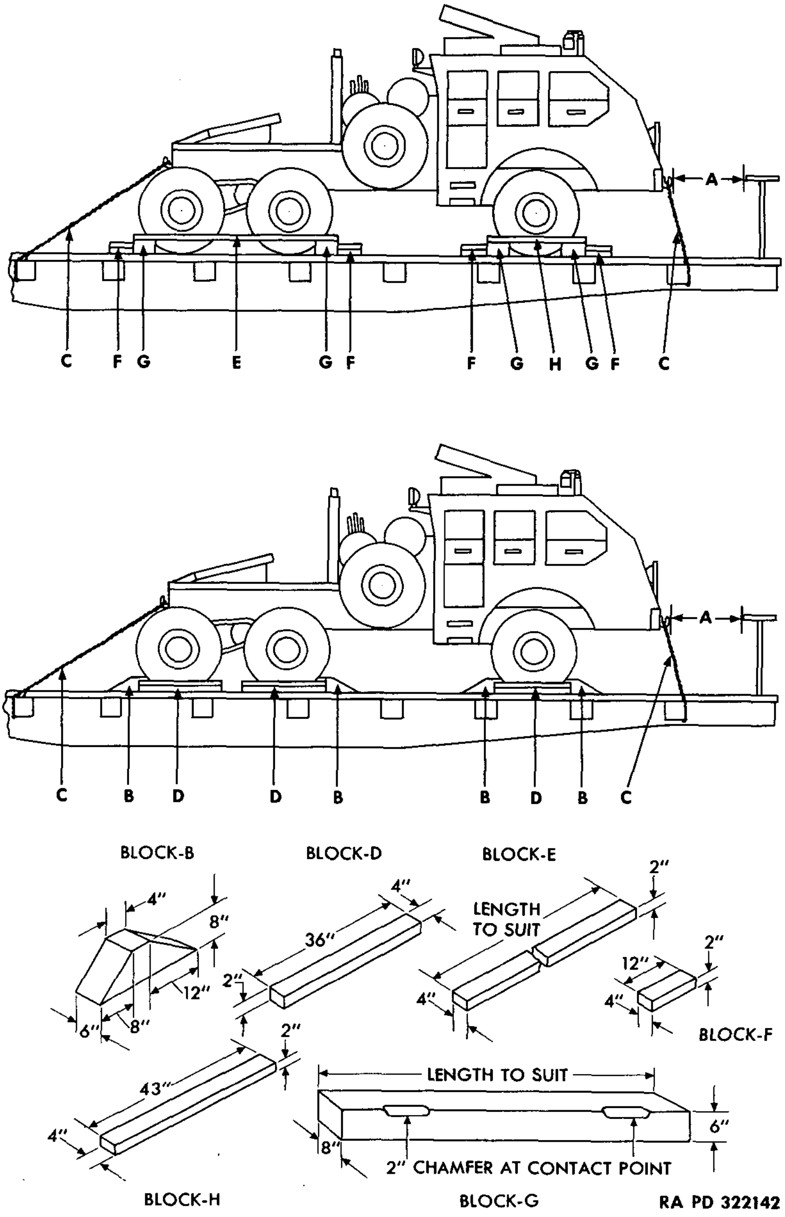
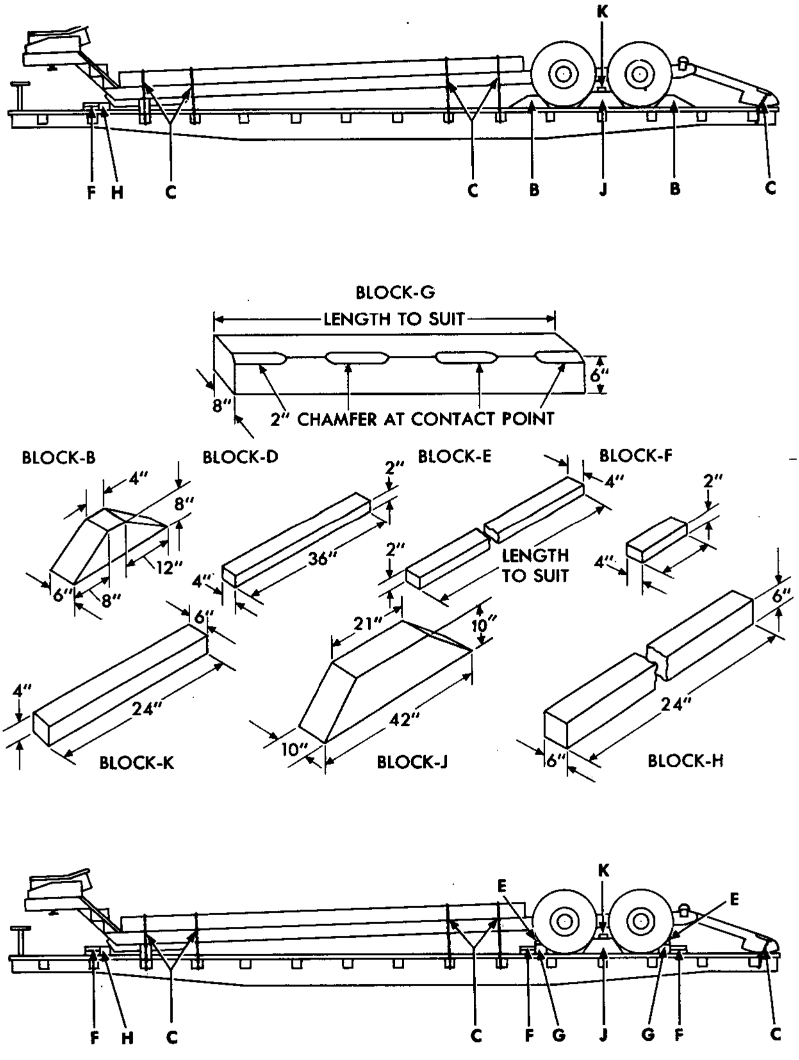

A
C
F
G
E
G
F
F
G
H
G
F
C
A
C
B
D
D
B
B
D
B
C
BLOCK-B
4"
8"
12"
6"
8"
BLOCK-D
4"
36"
2"
BLOCK-E
2"
LENGTH TO SUIT
4"
2"
12"
4"
BLOCK-F
2"
43"
4"
BLOCK-H
LENGTH TO SUIT
6"
8"
2" CHAMFER AT CONTACT POINT
BLOCK-G
RA PD 322142

*Figure 335—Blocking Requirements—Tractor Truck*


K
F
H
C
C
B
J
B
C
BLOCK-G
LENGTH TO SUIT
6"
8"
2" CHAMFER AT CONTACT POINT
BLOCK-B
4"
8"
12"
6"
8"
BLOCK-D
2"
36"
4"
BLOCK-E
4"
2"
LENGTH TO SUIT
BLOCK-F
2"
4"
6"
4"
24"
BLOCK-K
21"
10"
42"
10"
BLOCK-J
6"
24"
6"
BLOCK-H
K
E
E
F
H
C
C
F
G
J
G
F
C

RA PD 322143

*Figure 336—Blocking Requirements—Semitrailer*

rear wheels and one to the rear of the rearward rear wheels. These blocks are to be at least 8 inches wider than the over-all width of the vehicle at the car floor. Locate 16 cleats "F" against blocks "G" to the front and to the rear of each blocked wheel. Nail the lower cleat to the car floor with five 40-penny nails and the top cleat to the cleat below with five 40-penny nails. Position two cleats "H" one over two blocks "G" and against the outside of each front blocked wheel. Nail each end of cleats "H" to the top of each block "G" with two 40-penny nails. In the same manner, fasten two cleats "E" over the blocks for the rear wheels. Pass four strands, two wrappings, of No. 8 gage, black annealed wire "C" through the bumper lugs on the front of the vehicle, and then through stake pockets on opposite sides of the freight car. Pass also the same number of strands of wire through the pintle hook on the rear of the vehicle, and then attach to stake pockets on opposite sides of the freight car. Tighten all wires enough to remove slack.

**d. Securing Vehicles (Semitrailer).**

(1) METHOD 1 (fig. 336). Locate four blocks "J," one between each tandem set of wheels. Toe-nail blocks "J" securely to the floor of the freight car with 40-penny nails. Position two cleats "K," on top of each set of blocks "J." Nail the cleats to the blocks with 40-penny nails. Locate eight blocks "B," one to the front of each forward wheel and one to the back of each rearward wheel. Nail the heel of each block to the car floor with five 40-penny nails, and toe-nail the portion of each block under the tire to the car floor with two 40-penny nails. Position block "H" against forward end of semitrailer. Locate eight cleats "F" against block "H," in pairs, one on top of the other, equally spaced across the car floor. Nail lower cleats to the car floor with five 40-penny nails, then nail top cleat "F" to lower cleat "F" with five 40-penny nails. Pass four strands, two wrappings, of No. 8 gage, black annealed wire ("C," fig. 336) through the handles on the permanent skids, and pass through the stake pockets. Also pass the same number of strands of wire across the bed of the semitrailer at four points (fig. 336). Fasten the wire to opposite stake pockets. Tighten guy wires enough to remove the slack.

(2) METHOD 2 (fig. 336). The second method varies from the first only in the blocking of the wheels. Secure the four blocks "J" and two cleats "K" as described in step (1) above. Place two blocks "G" one to the front of the forward wheels and one to the back of the rearward wheels. Locate 16 cleats "F," 8 to the front and 8 to the rear of the wheels. Locate the cleats "F" against the blocks "G," in pairs, one on top of the other, equally spaced across the car floor. Nail lower cleats to the car floor with five 40-penny nails, then nail top cleat "F" to lower cleat "F" with five 40-penny nails. Position two cleats "E" on top of blocks "G," between the tires. Nail the cleats to blocks "G." Complete the securing of the vehicle by following step (1) above.

**e. Shipping Data.**

| | Truck | Semitrailer |
|---|---|---|
| Over-all length | 25 ft 4 in. | 44 ft 2 in. |
| Over-all width | 10 ft 10¾ in. | 12 ft 6 in. |
| Height | 11 ft 5 in. | 8 ft 9 in. |
| Shipping weight | 42,000 lb | 36,100 lb |
| Approximate floor area | 275.8 sq ft | 552.5 sq ft |
| Approximate volume | 3184.1 cu ft | 4834.4 cu ft |
| Bearing pressure (lb per sq ft) | 152.3 | 65.3 |

# REFERENCES

## PUBLICATION INDEXES.

The following publications indexes should be consulted frequently for latest changes to or revisions of the publications given in this list of references and for new publications relating to materiel covered in this manual:

| | |
|---|---|
| Ordnance publications for supply index (Index to SNL's) | ASF Cat. ORD-2 OPSI |
| Index to ordnance catalog (explains SNL system) | ASF Cat. ORD-1 IOC |
| Index to ordnance publications (lists FM's, TM's, TC's and TB's of interest to Ordnance personnel, MWO's (FSMWO's), BSD, S of SR's OSSC's and OFSB's. Includes alphabetical listing of Ordnance major items with publications pertaining thereto) | OFSB 1-1 |
| List of publications for training (lists MR's, MTP's, T/BA's, T/A's, and FM's, TM's, and TR's concerning training) | FM 21-6 |
| List of training films, film strips and film bulletins (lists TF's, FS's and FB's by serial number and subject) | FM 21-7 |
| Military training aids (lists graphic training aids, models and displays) | FM 21-8 |

## STANDARD NOMENCLATURE LISTS.

| | |
|---|---|
| Truck, trailer, 40-ton, tank recovery, M25 (T21) (composed of Truck Tractor, M26 (T25); Trailer, M15, (T28) | SNL G-160 |
| Cleaning, preserving and lubrication materials, recoil fluids, special oils and miscellaneous related items | SNL K-1 |
| Soldering, brazing and welding materials, gases and related items | SNL K-2 |
| Tool Sets—motor transport | SNL N-19 |

## EXPLANATORY PUBLICATIONS.

### General.

| | |
|---|---|
| Military motor vehicles | AR 850-15 |
| Standard military motor vehicles | TM 9-2800 |
| Drivers selection and training | TM 21-300 |
| Precautions in handling gasoline | AR 850-20 |

## REFERENCES

### Related Technical Manuals.

| | |
|---|---|
| Ordnance maintenance: Engine for tractor truck M26, component of 40-ton tank transporter trailer truck M25 | TM 9-1767A |
| Ordnance maintenance: Power train for tractor truck M26, component of 40-ton tank transporter trailer truck M25 | TM 9-1767B |
| Ordnance maintenance: Body, chassis and winches for tractor truck M26, component of 40-ton tank transporter trailer truck M25 | TM 9-1767C |
| Ordnance maintenance: Semitrailer M15, component of 40-ton tank transporter trailer truck M25 | TM 9-1767D |
| Ordnance maintenance: Electrical equipment (Auto-Lite) | TM 9-1825B |
| Ordnance maintenance: Carburetors (Zenith) | TM 9-1826C |
| Ordnance maintenance: Power brake systems (Bendix-Westinghouse) | TM 9-1827A |
| Ordnance maintenance: Fuel pumps | TM 9-1828A |
| Maintenance and care of pneumatic tires and rubber treads | TM 31-200 |

### Automotive Materiel.

| | |
|---|---|
| The motor vehicle | TM 10-510 |
| Automotive electricity | TM 10-580 |
| Electrical fundamentals | TM 1-455 |
| Fuels and carburetion | TM 10-550 |
| The internal combustion engine | TM 10-570 |

### Care and Preservation.

| | |
|---|---|
| Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department | TM 9-850 |
| Explosives and demolitions | FM 5-25 |
| Basic maintenance manual | TM 38-250 |
| Product guide | OFSB 6-2 |
| Motor vehicle inspections and preventive maintenance services | TM 9-2810 |

### Decontamination.

| | |
|---|---|
| Chemical decontamination materials and equipment | TM 3-220 |
| Decontamination of armored force vehicles | FM 17-59 |
| Defense against chemical attack | FM 21-40 |

**Storage and Shipment.**

| | |
|---|---|
| Registration of motor vehicles | AR 850-10 |
| Rules governing the loading of mechanized and motorized army equipment, also major caliber guns, for the United States Army and Navy, on open top equipment published by Operations and Maintenance Department of Association of American Railroads. | |
| Storage of motor vehicle equipment | AR 850-18 |
| Ordnance field service storage and shipment chart, group G—major items | OSSC-G |

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